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YELLOW FEVER.

SOPER (F. L.), PENNA (H.), CARDOSO (E.), SERAFIM (J.), JR., FROBISHER (M.), JR. & PINHEIRO (J.). **Yellow Fever without** *Aëdes aegypti*. **Study of a Rural Epidemic in the Valle do Chanaan, Espirito Santo, Brazil, 1932.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 555–587. With 4 maps. [18 refs.]

A detailed account of an epidemic of yellow fever, which lasted for at least 3 months, in a district in which *Aëdes aegypti* was not found even after a prolonged search begun 6 weeks before the apparently spontaneous disappearance of the outbreak.

Yellow fever has long been considered as an essentially urban disease; consequently the occurrence of a strictly rural epidemic, occurring in the valley of Chanaan, Espirito Santo, Brazil, from January to April, 1932, is of interest. No cases of the disease had been recorded from this State since a sharp outbreak in Victoria during 1917 and 1918. Nevertheless the Municipio of Santa Thereza, of which the Valle do Chanaan is a part, had been a suspected area, owing to the absence of any obvious cases of yellow fever during 1928 to 1931, when it was known to be present in the neighbouring State. Santa Thereza was inspected, but the absence of *Aëdes aegypti* led to its being struck off the list of suspected localities. However a fatal case of yellow fever, in which the diagnosis was confirmed by postmortem examination, led to field investigations, and the existence of the disease in the valley was confirmed by further autopsies and by animal inoculations. A total of 83 suspected cases with 9 deaths occurred in three months, widely scattered over a rural district of about 20 square miles. Out of 412 blood specimens collected in the suspected area, 62 sera protected, a low percentage in view of the epidemic and rumours of previous invasions in the valley. The spontaneous disappearance of the disease is attributed to the inefficiency of the insect vector, rather than to failure of the human host.

In spite of a very careful entomological survey no specimens of *Aëdes aegypti* were found, but various other species of mosquitoes which have been incriminated by laboratory experiments were present, although only *Aëdes scapularis* and *A. fluviatilis* in sufficient numbers to be considered responsible for the epidemic. *A. scapularis* was found the more frequently and is believed to be the more dangerous species.

E. Hindle.

SOPER (Fred L.) & DE ANDRADE (Alvaro). **Studies of the Distribution of Immunity to Yellow Fever in Brazil. II. The Disproportion between Immunity Distribution as revealed by Complement-Fixation and Mouse-Protection Tests and History of Yellow Fever Attack at Cambucy, Rio de Janeiro.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 588–617. With 3 charts.

An interesting epidemiological survey in Cambucy, Brazil, during and after a small epidemic in this previously endemic area, based on history of illness, complement fixation and mouse protection tests. The results indicated that the distribution of immunity bore very little relationship to the recognition of typical cases of the disease, but was highly correlated with recent cases of so-called "grippe" without respiratory symptoms.

Cambucy is a small town with a population of less than 1,000, on the Parahyba River in the State of Rio de Janeiro. From 1908 to 1928 no cases of yellow fever had been recorded from the whole State, but then the epidemics of 1928 and 1929 were followed by isolated outbreaks and between November, 1930, and February, 1931, there were 13 clinical cases with 5 deaths in Cambucy. In addition, however, there was a widespread epidemic of a relatively mild type, characterized by fever, headache, and body pains, and to a lesser extent by nausea, vomiting, and icterus. Out of a population of 823, the number of these cases was 227, the majority of them occurring in December (63) and January (98). An examination of the sera of 555 persons by mouse protection tests gave approximately 60 per cent. positives. Complement fixation tests with these sera collected either at the end of the epidemic or 8 months later gave positive percentages of approximately 20 and 13 respectively, so there is evidently a rapid loss of complement fixing bodies. Similar tests with the sera of persons with a history of recent illness gave approximately 90 per cent. positive with the mouse protection test, compared with about 47 per cent. positive in persons without such history. A considerable number of these latter, however, even in the younger age groups, were found to be immune, indicating that immunization may often occur without illness sufficiently severe to be remembered.

In the case of complement fixation tests the percentage of positive results was significantly higher 6 to 10 weeks after an attack than either before or after this time.

"The results of this study indicate that epidemiological investigations unsupported by laboratory tests and autopsies, are bound to be falsely comforting in endemic yellow fever areas in which there is little movement of foreigners." *E. H.*

MAHAFFY (Alexander F.), LLOYD (Wray) & PENNA (H. A.). **Two Years' Experience with the Intraperitoneal Protection Test in Mice in Epidemiological Studies of Yellow Fever.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 618–628.

The authors give valuable practical details for the application of the intraperitoneal protection test in mice and then analyse the results of the examination of 3,274 sera.

The analysis of these 3,274 specimens shows that only 111 (3·4 per cent.) gave inconclusive results. Of these 77 were tested a second time and 28 were positive, 24 negative, and 25 remained inconclusive. In the normal serum control, the number of mice used was 1,069 of

which 77 (7·2 per cent.) survived. Using this test the incidence of immune protecting bodies in the sera of persons in certain areas of Brazil and West Africa shows 61 and 72 per cent. positive in regions visited by recent epidemics compared with completely negative results from regions never infected with yellow fever. These findings are in close agreement with the results of protection tests in *rhesus* monkeys, with sera from the same two infected areas—respectively 55·3 per cent. and 68 per cent. positive.

The ease with which the intraperitoneal protection test in mice can be applied to field studies on a large scale and its reliability make it of practical as well as of theoretical value in epidemiological studies of yellow fever. *E. H.*

PETTIT (Auguste) & STEFANOPOULO (Georges J.). Utilisation du sérum antiamaril d'origine animale pour la vaccination de l'homme. [**The Use of Animal Anti-Yellow Fever Serum for Human Vaccination.**]—*Bull. Acad. Méd.* 1933. July 18. 97th Year. 3rd Ser. Vol. 110. No. 28. pp. 67–76. [27 refs.]

The authors have prepared anti-yellow fever serum in 4 horses and 13 large monkeys, including one chimpanzee and 12 baboons, by repeated injections of yellow fever virus. With one exception all the baboons produced efficient antisera, but of the 4 horses only two furnished a sufficiently high titre, the best serum being obtained from a young individual. The action of these animal sera in preventing infection in *Macacus rhesus* is very marked, for monkeys inoculated with immune serum, either baboon or horse, up to four days after receiving an injection of the virus, failed to become infected.

Specimens of antisera were tested in mice by Drs. SAWYER and WHITMAN in New York, and the results of their tests are given in tabular form. It is evident that the majority of these antisera contain a high titre of antibodies and might well replace human convalescent serum in the virus-immune serum method of vaccination. *E. H.*

LAIGRET (J.). Recherches expérimentales sur la fièvre jaune (troisième mémoire). Technique pour la préparation des vaccins amarils, vaccins glycérinés et vaccins secs. [**Experimental Studies on Yellow Fever. Technique for the Preparation of Glycerinated and Dry Yellow Fever Vaccines.**]—*Arch. Inst. Pasteur de Tunis.* 1933. Aug. Vol. 22. No. 2. pp. 198–204.

The author has prepared both dry and glycerinated yellow fever vaccines from the brains of mice infected with neurotropic yellow fever virus.

Glycerine suspensions of the infected brains were exposed, in the dark, to room temperatures for periods of one, two, three and four days, respectively, and then kept in the refrigerator at about −15°C. The suspensions were then tested for virulence by diluting them with saline solution and inoculating various dilutions into mice. When dilutions of 1/10,000 are fatal the vaccine is too virulent for use; dilutions of 1/100 to 1/1,000 producing fatal infections can be used for the third vaccination; those of 1/100 or less for the second vaccination, and the vaccine producing no fatal infections in mice is used for the first vaccination. These three inoculations are given at intervals of 20 days in the order indicated above, each comprising 1 cc. of a 1/100 dilution of the attenuated virus.

Dry vaccines are prepared by attenuating the whole mouse brain in glycerine at room temperature, in the same way as suspensions. After attenuation each brain is ground up with 1·5 gm. of a sterile mixture of 20 parts Na_2HPO_4 and 3 parts of $KH_2 PO_4$. The ground up material is then dried *in vacuo* over sulphuric acid for 24 hours, and titrated. The doses and method of vaccination are similar to those used in glycerinated suspensions, *viz.*, three injections of 0·01 gm. of the dried material, at successive stages of attenuation, at intervals of twenty days.

With this method the doses of virus are exactly known and immunity is produced with minimal quantities of virus. This method has been used with success for the vaccination of three human subjects.

E. H.

ARAGAO (Henrique de Beaurepaire). Transmission de la fièvre jaune par les tiques. [**Transmission of Yellow Fever by Ticks.**]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 137–139.

A record of the successful transmission of yellow fever from infected to normal monkeys by the bites of three species of ticks, *Amblyomma cajennense, Ornithodorus rostratus* and *O. moubata*, and also the infectivity of eggs laid by the first of these species.

It was found that when females of the tick *A. cajennense* were inoculated, by means of a fine needle, with a few drops of infected blood, virus was still present six days later. A batch of *A. cajennense* were then allowed to feed on a monkey infected with yellow fever. Three days after being removed from this animal 2 nymphs and 6 females, all partially engorged, were allowed to feed on a normal *rhesus* monkey. After an incubation of 13 days it showed a rise in temperature and died 3 days later with typical symptoms of yellow fever. In addition two monkeys inoculated with emulsions of two female ticks, removed from the first monkey respectively 7 and 14 days previously, both died of the disease. One of these females that had fed on the first monkey began to lay eggs on the 8th day after feeding and continued to lay until killed on the 14th day to prove its infectivity. Eleven days later 200 of these eggs were inoculated into a young monkey which died of yellow fever after 16 days.

An infected monkey was bitten by a batch of *Ornithodorus rostratus*. After an interval of 4 days, 6 of these ticks were fed on a normal monkey, which became infected after an incubation period of 11 days and was killed on the 13th day with typical symptoms of the disease. Additional experiments with *O. rostratus* and *O. moubata* showed that the infection did not persist in these ticks for more than 4 days.

[The presence of yellow fever virus in the eggs of a tick, at least 11 days after being laid by a female that had fed on an infected animal 25 days previously, is a very remarkable observation, and suggests the possibility of *Amblyomma cajennense* being a reservoir of infection.]

E. H.

DAVIS (Nelson C.). **The Survival of Yellow Fever Virus in Ticks.**—*Amer. Jl. Trop. Med.* 1933. Nov. Vol. 13. No. 6. pp. 547–554.

A description of experiments showing that yellow fever virus will survive in various species of ticks for considerable periods, but no evidence was obtained in support of the view that the virus may pass

from one generation to another through the egg or that the virus was transmitted by the bites of infected ticks at any stage. [Compare with ARAGÃO's results, above.]

Four species of ticks were used in these experiments, *Argas persicus* (Oken), *Amblyomma cajennense* (Fabr.), *Rhipicephalus sanguineus* Latreille, and *Boophilus microplus* Canestrini (=*B. annulatus microplus*). In every case the ticks were allowed to feed on an infected monkey and then tested for infectivity after various intervals. The results show that adult *Argas persicus* injected six days after the infective meal caused fatal yellow fever ; adult *A. cajennense* after 15 days caused fatal yellow fever, but after 28 days gave rise to immunity without any clinical signs of the disease ; adult *R. sanguineus* after 23 days and nymphs after 10 days both caused fatal yellow fever ; and larvae of *B. microplus* injected after 10 days also produced fatal yellow fever. Great irregularity was noticed in the length of time the virus survived in ticks and the above figures represent the maximum periods obtained. There was no evidence that the virus survived from one generation to the next, or from larval to nymphal stages. With reference to ARAGÃO's record of transmission by the bite of *A. cajennense,* it is pointed out that some of the ticks that fed on the monkey were lost, and as the animal had its hind legs free it may have destroyed these ticks. Since yellow fever virus is known to pass through intact skin or mucous membranes, the infection produced in this monkey may have been due to surface contamination with the infected contents of these ticks, rather than the result of their bites. In addition, the virus was found to survive for at least six days in chicken mites that had fed on an infected monkey at the height of fever. *E. H.*

DAVIS (Nelson C.), FROBISHER (Martin), Jr. & LLOYD (Wray). **The Titration of Yellow Fever Virus in Stegomyia Mosquitoes.**—*Jl. Experim. Med.* 1933. Aug. 1. Vol. 58. No. 2. pp. 211–226. With 1 chart.

The present series of titration experiments shows conclusively that in *Aëdes aegypti* the quantity of virus present never surpasses that originally ingested.

A series of tables is reproduced from which it appears that the average mosquito engorging on highly infectious yellow fever blood, contains between 1 and 2 million lethal doses of virus. During the succeeding fortnight there is a reduction of titrable virus to not more than 1 per cent. of that present in freshly fed insects. Subsequently the titre seems to rise but this may be only the result of an increase of extra-cellular virus, and of that more easily freed by grinding. It would appear, therefore, that in spite of the so-called incubation period in the mosquito, during which the virus migrates to the salivary glands, transmission is essentially mechanical, and for this peculiar type the authors suggest the term " delayed mechanical." *E. H.*

LLOYD (Wray), PENNA (H. A.) & MAHAFFY (Alexander F.). **Yellow Fever Virus Encephalitis in Rodents.**—*Amer. Jl. Hyg.* 1933. Sept. Vol. 18. No. 2. pp. 323–344. [12 refs.]

After 250 passages in mice there seems to be a progressively increasing degree of fixation for nervous tissue, indicated by a gradually diminishing incubation period. Whereas in the earlier passages most of the

mice died 7 to 8 days after inoculation, at the 250th passage a considerable proportion die within 72 hours and only very exceptionally do they survive over 4 days. It was found that mice inoculated into the fore part of the cerebrum had a shorter incubation period than others inoculated into the cerebellum.

Guineapigs were found to be susceptible to the intracerebral inoculation of the neurotropic mouse virus, and also the agouti (*Dasyprocta aguti*). The nature of the virus was not altered in any way by passage in the nervous system of these two animals. *E. H.*

THEILER (Max). **The Susceptibility of Guinea Pigs to the Virus of Yellow Fever.**—*Amer. Jl. Trop. Med.* 1933. July. Vol. 13. No. 4. pp. 399–414. [12 refs.]

Guineapigs were found to be susceptible to the intracerebral injection of yellow fever virus fixed for mice and this virus has been maintained in them for 40 passages by brain to brain inoculation.

The French strain after 158 mouse passages was used to infect guineapigs which from the first developed a typical encephalitis that could be transmitted serially. The course of the disease in these animals was somewhat irregular. The incubation period varied from 4 to 15 days and the animals then showed a temperature of 40°C., or over, for one or two days, and then died, usually without showing any paralytic symptoms. The amount of virus in the brain never exceeded 1 : 10,000 and was usually 1 : 1,000, whereas in mice dilutions of 1 : 1,000,000 were usually infective. There was no obvious change in the virus after passage in guineapigs, either in these animals or in mice. The distribution of the virus in guineapigs and its method of travelling along the nerve tissue is essentially the same as in mice, the blood playing no part in the spread of the virus.

Although guineapigs inoculated intracerebrally with virus from monkeys often died with marked encephalitis, and haemorrhages in the stomach, all attempts to maintain the virus by brain-to-brain passage invariably failed. The intraperitoneal inoculation of the monkey virus into guineapigs was followed by the development of antibodies similar in titre to those obtained from convalescent sera from recently infected men, but no evidence could be obtained that they underwent infection with yellow fever. Haemorrhage into the stomach, which often follows the injection of monkey virus, was found to occur also in guineapigs that had received injections of normal monkey serum, and even in untreated animals, so cannot be considered as of any significance.

The encephalitis produced by the virus fixed for mice was characterized by a perivascular infiltration of mononuclear cells and was sometimes restricted to a small proportion of the vessels. The extensive necrosis of the hippocampus and specific nuclear changes, which are characteristic features in mice, have not been found in guineapigs. Intranuclear acidophilic bodies confined to neuroglial cells, and somewhat resembling those induced in guineapig brains by salivary gland virus, were found in a few cases. Similar inclusions have also been seen on rare occasions in mouse brains. Their nature and significance is unknown. *E. H.*

FROBISHER (Martin), Jr. **A Comparison of Certain Properties of the Neurotropic Virus of Yellow Fever with those of the Corresponding Viscerotropic Virus.**—*Amer. Jl. Hyg.* 1933. Sept. Vol. 18. No. 2. pp. 354–374. With 1 fig. [21 refs.]

An interesting comparison of the properties of these two types of yellow fever virus. Both were found to have approximately the same resistance to heat. As regards chemicals the neurotropic virus may have been slightly more resistant to 16·7 per cent. ethyl alcohol than the viscerotropic virus, and it also resisted the action of 0·3 per cent. methylene blue.

The antigenic properties of the two types, as tested by complement fixation, indicate that antigens prepared from neurotropic material react more strongly with sera from animals immune to this type of virus than with sera from those immune to viscerotropic virus and *vice versa*. The most marked difference was found in the electrical properties. The neurotropic virus in the electrical field had two broad isoelectric zones, one below pH 6·9, and the other above pH 7·2. Between pH 6·9 and 7·2 (the isoelectric range of the viscerotropic virus) it usually migrated to both poles. In the presence of partly laked cells and haemoglobin it migrated, as did the viscerotropic virus under the same circumstances, to both positive and negative poles, even at a reaction well within its isoelectric range. The neurotropic virus in serum suspensions resisted 3 hours exposure to acidities and alkalinities ranging from pH 5·7 to pH 9·2. *E. H.*

HUGHES (T. P.). **A Precipitin Reaction in Yellow Fever.**—*Jl. Immunology.* 1933. Sept. Vol. 25. No. 3. pp. 275–294. With 3 figs. [24 refs.]

The author has elaborated a precipitation test for yellow fever which may be of value in the differential diagnosis of acute infections.

A standard immune serum is run into the precipitation tubes and the serum to be tested carefully layered on top without mixing. The tubes are then heated to 37°C. for two hours and examined by artificial light against a dark background. The development of a ring at the junction of the two sera indicates the presence of a precipitinogen in the serum to be tested and is highly specific. It was found in high concentration in the serum of 53 out of 54 monkeys infected with various strains of yellow fever. The one exception was a monkey that died on the third day following injection but the case was complicated by ulcerative colitis. Sera from 12 monkeys immunized by the injection of virus and immune serum showed no trace of any circulating precipitinogens, and their blood examined 4 weeks later showed no precipitins. There is no parallelism between the virus content and precipitinogen in the serum, for whereas the concentration of the former reaches a high point on the first day of fever and decreases during the terminal day, the precipitinogen does not appear until after the first day and increases up to the end of the infection. Moreover monkeys insensible to the action of yellow fever virus when inoculated with large doses of the virus developed no trace of precipitinogens or precipitins, although protective antibodies were present in high concentration. Monkeys inoculated with the neurotropic virus also failed to show any trace of circulating precipitinogen, but such animals generate precipitins active against an antigen occurring in infected brain tissue.

It was shown that the precipitinogen is associated with the albumin fraction of the serum. The relation of precipitation to complement fixation is discussed and observations are brought forward suggesting that in some cases the precipitation reaction may be the basis for the phenomenon of complement fixation. Both tests were applied to immune sera from 10 persons who had had yellow fever 4½ to 7½ months previously. The precipitin content varied, being entirely absent in 5 of them, and present in the others, one being positive when diluted 1 in 64. The only three giving complement fixation showed precipitin titres of 1 : 16, 1 : 32 and 1 : 64 respectively. The reaction is entirely independent of the protective antibody resulting from an infection.

E. H.

HAAGEN (E.). Ueber die Notwendigkeit lebender Zellen zur Virus-züchtung. Weitere Untersuchungen ueber das Gelbfieber-, Variola-Vakzine- und Herpesvirus. [**The Necessity of Living Cells in Virus Cultures. Further Studies on Yellow Fever, Variola, Vaccinia, and Herpes Virus.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Aug. 15. Vol. 129. No. 3/4. pp. 237–254. [25 refs.]

The author made numerous attempts to culture these viruses in the absence of living cells, following the methods described by EAGLES and KORDI. With yellow fever virus although 5 out of 13 such cultures were positive in the 1st passage, there was a marked diminution in the virus content, and further passages were negative. On the contrary, in monkey serum containing living cells from a fowl embryo, the virus multiplied and could be maintained indefinitely in culture passages without any diminution in virus content.

Yellow fever immune serum was found to have no effect on the virus *in vitro*, so long as living cells were present, but when the cells were killed the virus was neutralized by the immune serum. The author's experiments support the view that in the case of these four viruses the presence of living cells is essential for growth in cultures. *E. H.*

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE. 1933. July. Vol. 19. No. 3. pp. 186–200.—**Outbreak of Yellow Fever, 1859. Extract from the Journal of Surgeon William MacLeod, R.N., H.M.S.** *Madagascar,* **at Rio de Janeiro.**

An interesting account of an outbreak of yellow fever in 1859, entered under the heading of " Remittent Fever," on board a naval ship at Rio de Janeiro. *E. H.*

LAIGRET (J.). La vaccination contre la fièvre jaune. [**Vaccination against Yellow Fever.**]—*Ann. de Méd. et de Pharm. Colon.* 1933. July.–Aug.–Sept. Vol. 31. No. 3. pp. 325–335.

A good general account of the subject with special reference to the titration and preservation of the mouse brain virus used for human vaccinations. *E. H.*

MRUGOWSKY (Joachim). Versuch einer Entwicklungsgeschichte des Gelbfiebers. [**Studies on the Historical Development of Yellow Fever.**] —*Arch. f. Hyg. u. Bakt.* 1933. Nov. Vol. 111. No. 2. pp. 104–112. With 1 fig. [23 refs.]

A general account in which Wegener's hypothesis of shifting continents is invoked to explain the distribution of yellow fever ! *E. H.*

STILL (John). **The Significance of Yellow Fever.**—*Jl. Roy. Army Med. Corps.* 1933. Oct. Vol. 61. No. 4. pp. 268–280. [24 refs.]

A general account with special reference to the possible spread of the disease. *E. H.*

HOFFMANN (W. H.). Hay fiebre amarilla en Santa Marta ?—Reprinted from *Rev. de Med. y Cirug. de la Habana.* 1932. Vol. 37. No. 8. p. 598.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

KEMP (Hardy A.), MOURSUND (W. H.) & WRIGHT (Harry E.). **Relapsing Fever in Texas. I. The Identity of the Spirochete.**—*Amer. Jl. Trop. Med.* 1933. July. Vol. 13. No. 4. pp. 425–435.

The authors have studied three strains of spirochaetes from human cases of relapsing fever in Texas, and by means of cross immunity tests (cytolysis, Pfeiffer phenomenon, etc.) show that the organism is immunologically identical with *Spirochaeta novyi*. From the available evidence, the disease seems to be primarily of animal origin and its occurrence in man of a fortuitous nature. *E. Hindle.*

BRUMPT (E.). Etude de la fièvre récurrente sporadiques des Etats-Unis, transmise dans la nature par *Ornithodorus turicata.* [**Study of the Sporadic Relapsing Fever of the U.S.A., transmitted in Nature by** *O. turicata.*]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1366–1369.

——. Etude du *Spirochaeta turicatae*, n. sp., agent de la fièvre récurrente sporadique des Etats-Unis transmise par *Ornithodorus turicata.* [**Study of** *Spirochaeta turicatae* **n. sp. its Causal Agent.**]—*Ibid.* pp. 1369–1372.

The author was able to obtain 300 examples of *Ornithodorus turicata*, from a cave near Austin, Texas, where cases of relapsing fever had occurred. Incidentally one of the patients, Dr. GRAHAM, collected these ticks, as he was supposed to be immune against relapsing fever, but he acquired a second attack of the disease after visiting the cave, although not conscious of having been bitten by ticks on this occasion. Two strains of the spirochaete from previous cases were studied and found to be transmissible by the bites of *O. turicata.* Mice, rats and *Peromyscus* were successfully infected, but results were negative with a guineapig, two spermophiles and two palm rats or squirrels.

The repeated negative results of all attempts to transmit *S. duttoni*, *S. hispanica* and *S. venezuelensis* by *O. turicata*, compared with the invariable success obtained with the American strain, supports the view that it is distinct from the others. The author after discussing the problem names the causative organism *Spirochaeta turicatae.* [The results of KEMP, MOORSUND and WRIGHT's observation (see above) leave no possible doubt of the identity of this strain with *Spirochaeta novyi* Schellack; consequently *S. turicatae* becomes a synonym of it.] *E. H.*

KASSIRSKY (J. A.). Diagnose und Klinik des mittelasiatischen Zecken-Rückfallfiebers. [**Diagnosis and Clinical Features of Central Asiatic Tick Fever.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Aug. Vol. 37. No. 8. pp. 380–387.

A description of the main features of Central Asiatic tick fever based on a study of 78 cases in the Hospital for Tropical Diseases at Tashkent.

The incubation period is 6 to 14 days and the first attack lasts 3 to 4 days with the usual symptoms of relapsing fever, but the aches of the calf muscles are said to be not so severe as in European relapsing fever. Also, when the temperature falls the patient recovers more quickly than in the latter disease. The number of febrile attacks may be as many as

20, but the average is 8 to 10. The prognosis is good, fatal cases being excessively rare. The spirochaetes—*S. sogdiana* var. *usbekistanica*—like many other tick fever organisms, are somewhat refractory to salvarsan treatment, but good results are said to have been obtained by giving 5 to 6 doses of 0·3 gm. neosalvarsan at intervals of 5 to 6 days. The immunity following the infection is apparently weak and of short duration, for in one case reinfection occurred after 11 months. European relapsing fever confers no immunity against infection with the Central Asiatic tick fever. *E. H.*

MATHIS (C.), DURIEUX (C.) & ADVIER (M.). Transmission naturelle et expérimentale à l'homme du spirochète infectant dans la nature, à Dakar, la tique *Ornithodorus erraticus* vel *marocanus*. (Note préliminaire.) [**Transmission to Man of the Spirochaete occurring in** *O. erraticus* **vel** *marocanus* **at Dakar.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1094–1098.

With batches of ticks, *O. erraticus*, collected from three neighbourhoods in Dakar the authors have made feeding experiments on 10 patients, and in 7 cases produced infection with typical relapsing fever.

Three cases of naturally infected cases of relapsing fever in Dakar are also described. The disease is indistinguishable from tick fever of tropical Africa, transmitted by *Ornithodorus moubata*, but in Dakar this tick is absent and its place taken by *O. erraticus*. *E. H.*

SERGENT (André), MANCEAUX (A.) & BALLISTE (R.). Premier cas de fièvre récurrente hispano-africaine observé en Algérie. [**The First Case of Spanish-African Relapsing Fever observed in Algeria.**]—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 906–908.

A record of a case of this disease occurring in a village about 30 miles west of Algiers. The nature of the infection was established by its high pathogenicity for guineapigs, the number and short duration of the relapses and the resistance to treatment with arsenicals. Numerous specimens of Ornithodorus were found in the village, living in the burrows of sewer rats. *E. H.*

HORRENBERGER (R.). Deuxième cas de fièvre récurrente hispano-africaine observé en Algérie. [**A Second Case of Spanish African Relapsing Fever observed in Algeria.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 993–995.

The record of a case of this variety of relapsing fever in a European living in the neighbourhood of Algiers. The nature of the infection was confirmed by inoculation into guineapigs. *E. H.*

BLANC (Georges), NOURY (M.), BALTAZARD (M.) & FISCHER. Présence, chez le pou de l'écureuil de Gétulie, d'un virus récurrent, type hispano-africain, pathogène pour l'homme et le cobaye. [**The Presence of Spanish-African Relapsing Fever, Pathogenic to Man and the Guineapig, in Squirrel Lice from Getulie.**]—*C. R. Acad. Sci.* 1933. Aug. 16. Vol. 197. No. 7. pp. 496–497.

A number of Getulie squirrels (*Atlantoxerus getulus*), collected near Agadir, were found to be heavily infected with lice (*Neohaematopinus pectinifer*). The brain of one of these squirrels was inoculated into a

guineapig, and the contents of 50 lice into a second one. The latter became infected with spirochaetes of Spanish-African type, and the infection was maintained by passage in guineapigs, and also used to produce a typical attack of relapsing fever in a human subject. The first guineapig, inoculated with the brain suspension, showed a rise in temperature, but no spirochaetes were ever detected in its blood. *E. H.*

ANDERSON (Ch.) & WASSILIEFF (A.). Note sur un nouveau spirochète récurrent pathogène pour l'homme, rencontré chez *Ornithodorus erraticus* du sud tunisien. [**New Relapsing Fever Spirochaete Pathogenic to Man, occurring in** *O. erraticus* **from South Tunisia.**]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1408–1409.

Specimens of *Ornithodorus erraticus* collected from burrows of *Meriones shawi*, a desert rodent, in the region of Ben Gardane, South Tunisia, were found to be infected with a strain of spirochaetes belonging to the *hispanica* group. The porcupine inoculated with this strain had a short infection with visible spirochaetes; the Meriones had a non-apparent infection with no visible spirochaetes; and a human subject showed a typical attack of relapsing fever. *E. H.*

SERGENT (André). Un nouvel agent de transmission naturelle de la récurrente hispano-africaine: la tique du chien (*Rhipicephalus sanguineus*). [**New Agent for Natural Transmission of Spanish-African Relapsing Fever: the Dog Tick** (*R. sanguineus*).]—*C. R. Acad. Sci.* 1933. Oct. 2. Vol. 197. No. 14. pp. 717–718.

The author examined the locality where the first Algerian case of Spanish-African relapsing fever occurred and found there numerous specimens of Ornithodorus, but 20 of these failed to produce infection in two guineapigs. The patient's dog, however, was heavily infested with *Rhipicephalus sanguineus*, and two of these, a male and a female, both produced spirochaetal infections when inoculated into guineapigs. The dog was examined for 28 days and its brain then inoculated into two guineapigs, but no trace of infection was detected. Larvae of the dog tick were then fed on infected guineapigs and after moulting the nymphs were allowed to gorge on four normal guineapigs. After 17 days incubation period one of these animals, a young individual, became infected, with numerous spirochaetes in the blood. It seems, therefore, that Spanish-African relapsing fever can be transmitted by the bite not only of Ornithodorus but also of *Rhipicephalus sanguineus*, the dog tick. *E. H.*

HIROKI (H.). Experimentelle Untersuchung ueber die Persistenz der Recurrensspirochaeten im Gehirn. III. Mitteilung: Ueber die Persistenz der neuen isolierten Recurrensspirochaetenstämme und die Frage zur Hypothese von Prigge und Rothermundt ueber den Persistierungsmechanismus der Recurrensspirochaeten im Gehirn von Mäusen. [**Persistence of Freshly Isolated Strains and the Question of Prigge and Rothermundt's Hypothesis as to the Way in which Relapsing Fever Spirochaetes persist in the Brains of Mice.**]—*Jl. Oriental Med.* 1933. Sept. Vol. 19. No. 3. [In Japanese. German summary pp. 23–26.]

Freshly isolated strains of Manchurian relapsing fever were found to be only very slightly pathogenic to mice, whilst the older strains produced a mortality of 90 per cent.

Four of these freshly isolated strains inoculated into mice never produced a residual brain infection, yet both these strains and the older ones produced similar attacks in human beings.

A series of 20 splenectomized and " blockaded " mice were inoculated at the same time as 20 normal controls. The infection in the former was more intense than in the latter, but in neither group did any of the mice show any residual brain infections 28 days after the original attack. After an interval of 60 days from the original infection 10 mice were inoculated with the homologous strain, and in every instance were immune.

The author in discussing PRIGGE and ROTHERMUNDT's hypothesis [see this *Bulletin*, Vol. 25, p. 592 ; Vol. 26, p. 114] makes a statistical analysis of their comparative mortality statistics for the African and Russian strains, and shows that there is no significant difference between them. Moreover, the results of the author's observations on these freshly isolated strains of Manchurian relapsing fever, only feebly pathogenic to mice, are entirely opposed to those recorded by these authors, and do not support their hypothesis that such strains are more likely to produce residual brain infections. *E. H.*

MARCHOUX (E.) & CHORINE (V.). Culture du spirochète des poules, Virus visible et invisible. [**The Culture of Visible and Invisible Stages of the Fowl Spirochaete.**]—*Ann. Inst. Pasteur.* 1933. Oct. Vol. 51. No. 4. pp. 477–502. [14 refs.]

The authors claim to have obtained cultures of an invisible phase of the fowl spirochaete using methods identical with those used for cultures of the ordinary spirochaete.

The most satisfactory culture medium was obtained by slightly modifying Galloway's method. The inclined clot of white of egg is covered with 5 cc. of a mixture of either 20 per cent. rabbit serum or 10 per cent. horse serum in Ringer's solution or physiological saline.

The addition of 3 to 5 drops of 10 per cent. peptone solution (Witte or Chapoteaut) to each tube brings the pH to between 7·4 and 7·7, the most favourable reaction, and after inoculating each tube with one or two drops of infected material, the medium is covered with a layer of vaseline. Without the addition of peptone the medium is too alkaline and growth of the spirochaetes inhibited. By making subcultures every 4 days rapid multiplication was obtained, but subcultures every 10 days are always successful. The addition of 0·1 per cent. glycogen was found to favour the growth of the organisms, but glucose, hydrolized starch, and dextrine had a deleterious effect.

The final medium recommended has the following composition :—

(1) Horse serum heated to 57–58°C. for three half-hour periods	10 cc.
(or rabbit or ox serum treated in the same way	20 ,,)
(2) 0·9 per cent. sterile physiological saline	100 ,,
(3) 10 per cent. sterile solution of peptone (Witte or Chapoteaut)	2 ,,
(4) 2 per cent. solution of glycogen, sterilized by filtration ...	5 ,,

This mixture is run into tubes containing an inclined clot of white of egg in sufficient quantity to immerse the clot and then covered with a layer of vaseline 1–2 cm. thick. The medium will keep for one or two months. Immediately before use it is necessary to add two or three drops of serum, haemoglobin, or preferably fresh defibrinated blood of

any animal. Virulent cultures of spirochaetes were obtained from the contents of infected ticks. The exteriors of the ticks were sterilized by immersing them in 5 per cent. phenol for 15–20 minutes, then washing in ether and drying on either sterile gauze or filter paper. Then by cutting off one of the legs it is possible to collect a small drop of coelomic fluid. By these means sterile cultures were obtained from ticks 9 times out of 13.

Cultures grew best at 37°C. but at lower temperatures the spirochaetes remained virulent. The necessary anaerobic conditions could be obtained by omitting the layer of vaseline and even the coagulated egg white and growing the spirochaetes together with *Bacillus eucarians*, a sporulating organism allied to *B. megatherium*. Mixed cultures of this nature have been continued for 62 passages and still remain virulent.

The blood of fowls exposed to the bites of numerous infected ticks was often found to be infective although no spirochaetes could be detected. Moreover, some fowls died without showing spirochaetes, and their blood was infective. Cultures of the blood of such birds were apparently negative for a varying number of passages, made every other day, but eventually showed spirochaetes, from which it is concluded that the invisible phase had grown in the culture tubes. In any particular experiment the tubes all became positive at the same time, but the " negative " period varied between 4 and 20 days in different tests. This invisible phase, like the spirochaete, was unable to pass through Chamberland L2 filters whilst in the blood, but in cultures was readily filterable although the spirochaetes were retained. The invisible phase is said to be present in the cells of the liver and spleen of an infected fowl and also in the blood of infected ticks. Both the invisible phase and the spiral form were found to be virulent.

The authors conclude that there are three stages in the development of the fowl spirochaete : When ingested by the tick, the spirochaete becomes transformed into an invisible but non-filtrable stage ; this same stage is also found during the first 4 days in the blood of fowls infected by the bites of ticks. In cultures this stage becomes filtrable until the reappearance of spiral forms when even the invisible stage again becomes non-filtrable. In spite of repeated examinations, no transition forms between the invisible stage and the fully formed spirochaete were ever detected. *E. H.*

HIMMELWEIT (Fred). Experimentelle Untersuchungen zum Krankheitsbild und zur Immunität bei der Hühnerspirochätose. [**Experimental Studies on the Course of the Disease and Immunity in Fowl Spirochaetosis.**]—*Ztschr. f. Hyg. u. Infektionskr.* 1933. Nov. 4. Vol. 115. No. 4. pp. 710–751. With 33 figs. [3 pages of refs.]

The author has repeated the work of a number of earlier investigators and also applied new methods (micromanipulation and tissue culture) and gives a very detailed account of the subject with special reference to the relative importance of phagocytosis and lysis in the disappearance of spirochaetes from the blood at the crisis of the infection, but without arriving at any very definite conclusions.

In common with previous observers the number of spirochaetes injected was found to influence the course of the disease and if very

few were injected the birds might develop an active immunity without showing spirochaetes in the blood. The author has made a careful study of the changes in the blood elements of infected fowls and young chickens. In adult birds at the beginning of the infection there is an absolute as well as a relative neutrophilia with a slight shift to the left. This appearance is accentuated until the height of the infection and is accompanied by an intense monocytosis. After the crisis there is a strong lymphocytosis and the monocytosis falls somewhat. In young chicks there is usually a neutrophilia at the beginning of the infection which changes into a neutropenia after about two days. Unlike adult birds, there is a strong lymphocytosis about the second or third day which continues until death. The monocyte reaction changes repeatedly in the course of the disease. Both adult and young birds showed anaemia, which was very severe in chicks but in adults disappeared a few days after the crisis. In both, the number of thrombocytes fell during the course of the disease, but in adult birds there was a sharp increase after the beginning of the crisis, whilst in young birds there was no corresponding rise. By means of micromanipulation, details of which are described, single blood cells were isolated and grown in a tissue culture medium. These cultures were subsequently infected with fowl spirochaetes and examined under the dark ground. Fibroblasts and small round cells were found to have no effect on living spirochaetes, these still being present in the cultures after 8 to 10 days.

Macrophages isolated from a normal spleen were found to act on the spirochaetes within about 30 hours. Macrophages from the spleen of an immunized bird, however, began to act within one hour and after 12 hours all living spirochaetes had disappeared. The fibroblasts and small round cells showed no phagocytic properties. After the addition of immune serum to cultures of normal macrophages, spirochaetes were ingested, from which it is concluded that spirochaetotropic antibodies are present in immune serum. *E. H.*

Schwetz (J.). Sur quelques spirochétoses de plusieurs espèces de mammifères, trouvées à Stanleyville (Congo Belge). [**Spirochaetal Infections in Several Species of Mammals found at Stanleyville (Belgian Congo).**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11 Vol. 26. No. 8. pp. 1032–1036.

A record of various spirochaetal infections found in the blood of mammals in the Belgian Congo, and transmission experiments with a strain found in cattle, *S. theileri*.

This spirochaete is very rare at Stanleyville for it was only once found in a herd of 1,000 cattle. Out of 19 cattle from Lake Albert 2 were slightly infected and in a herd of 300 near Stanleyville a 3 months'old calf showed fairly numerous spirochaetes in its blood combined with infections of *Theileria mutans* and *P. bigeminum*. A goat inoculated with its blood, after an incubation period of 20 days showed spirochaetes in the circulation for two days. A guineapig also inoculated remained negative. A single spirochaete 7–8μ long with 3 spirals was found in a film from a Cercopithecus infected with Plasmodium and a filaria, but with this exception the examination of large numbers of monkeys belonging to various species has given negative results. One fruit bat, *Eidolon helvum*, out of 73 examined, contained numerous spirochaetes in its blood, with lengths varying from 6 to 20μ. *E. H.*

MANTEUFEL (P.) & DRESSLER (I.). Gewebekultur in Tyrodelösung als Kulturmedium für Rekurrensspirochäten. [**Tissue Culture in Tyrode Solution as a Culture Medium for Relapsing Fever Spirochaetes.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Dec. 4. Vol. 130. No. 3/4. pp. 188–189.

The description of a new method of culturing relapsing fever spirochaetes using tissue cultures in Tyrode's solution.

The authors first redescribe the method of YUAN-PO [see this *Bulletin*, Vol. 30, p. 366] which they have found to give very good results in the cultivation of spirochaetes. They then describe a new method which consists in using pieces of allantoic membrane in Tyrode's solution. The membrane is obtained from the eggs after 11 to 12 days' incubation ; about 0·15 cc. of the allantoic tissue is put in a container with a mixture of 5 cc. Tyrode's solution and 1 cc. rabbit serum. The medium is inoculated with 1 to 2 drops of citrated blood of the infected animal and the cultures grown at 30–35°C. It is also advisable to add citrated blood to the subcultures. Using this method the authors have maintained a strain of the Spanish-Moroccan spirochaete for 38 passages, without any diminution in virulence for guineapigs and mice. The growth of spirochaetes in the cultures is said to resemble that obtained with YUAN-PO's medium. *E. H.*

DE BUEN (Sadi). La espiroquetosis española.—*Rev. San. e Hig. Pública.* 1932. Nov. Vol. 7. No. 11. pp. 1033–1052. With a full bibliography.

MEDULLA (Candido). La febbre ricorrente del Nord Africa in Cirenaica.—*Arch. Ital. Sci. Med. Colon.* 1933. Aug. 1. Vol. 14. No. 8. pp. 484–513. With 19 charts & 3 figs. [21 refs.] English summary (5 lines).

SARDJITO. Enkele eigenschappen van *Spirillum cardiopyrogenes* in de cultuur.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. June 20. Vol. 73. No. 13. pp. 822–824. With 2 figs. on 1 plate.

VICENTE PANIAGUA (J. M.) & SANCHEZ (Ernesto). Breve historia de la fiebre recurrente española en la provincia de Salamanca y dos nuevos casos diagnosticados en el dispensario de Ciudad Rodrigo.—*Rev. San. e Hig. Pública.* 1933. Sept. Vol. 8. No. 9. pp. 239–244. With 1 fig.

LEPTOSPIROSIS.

KADANER (M.) & CORTI (E.). Etude d'une épidémie ayant sévi parmi les Européens de Stanleyville et due vraisemblablement à L. ictero-hemorragiae. [**Study of an Epidemic among Europeans at Stanleyville, probably due to** *S. icterohaemorrhagiae.*]—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol. 13. No. 3. pp. 285–315. With 10 charts. [22 refs.] [Summary appears also in *Bulletin of Hygiene.*]

A description of the clinical symptoms of 16 cases of a febrile infection occurring among Europeans at Stanleyville, Belgian Congo, which was probably a form of Weil's disease, acquired whilst bathing.

This disease has not been recorded previously from the Congo, and in the present series of cases spirochaetes were not found, but three of the sera tested by PETTIT in Paris, and two of the same three tested by

SCHÜFFNER in Amsterdam, were found to agglutinate *S. icterohaemorrhagiae* in high dilutions. The infection was supposed to be derived from a swimming bath, since all the cases occurred among people who used the bath. Moreover the bath was opened in April and 8 cases occurred between the 3rd and 16th of May. It was then closed and not re-opened till July and 7 new cases occurred between August 18 and September 5, when it was finally closed. The only other case was that of a man who bathed in an adjoining river. Six of the cases relapsed and one was fatal. *E. Hindle.*

LINGEN (F. F. L.). Enkele gevallen van leptospirosis in Oeloe-Soengai (Z. en O. Afdeeling van Borneo). [**Cases of Leptospirosis in Borneo.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Aug. 15. Vol. 73. No. 17. pp. 1073–1078.

The description is given of six cases of Weil's disease (leptospirosis), both clinical and bacteriological. The syndrome of the disease as compiled from 5 cases was as follows :—

Acute onset with cold shivering and then an irregular temperature of indefinite type ; in all cases more or less injected conjunctivae ; headache and lumbar pain with, in two cases, cramps in the calf region and sleeplessness in spite of great exhaustion ; diarrhoea or constipation ; in all cases marked renal irritation and some albuminuria ; strongly positive urobilin reaction ; a urinary sediment showing some leucocytes, some erythrocytes and numerous hyaline and leucocyte casts ; total anuria in all 3 European cases ; uraemia in the fatal case ; in all cases lowering of the blood pressure and a soft, enlarged, painful liver ; jaundice only in the fatal case ; no enlargement of the spleen ; slight swelling of the lymph nodes ; no leucocytosis, a slight shift to the left and in 2 cases a lymphopenia. No leptospirae could be found in the urine because the appliances were not available. *W. F. Harvey.*

MOCHTAR (A.). Over het voorkomen van de ziekte van Weil te Semarang en omstreken. [**Weil's Disease in Semarang and Neighbourhood.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Sept. 12. Vol. 73. No. 19. pp. 1182–1188.

Nine cases of Weil's disease have been diagnosed in Semarang since the first established case in 1932. None of the patients admitted bathing in the highly polluted canal water. Rats were very numerous in the area from which most of the affected persons came and an investigation into the question of rat-carriage furnished 8 out of 20 sewer rats with leptospira. The actuality of the disease was established by serological (agglutination and lysis) tests and by finding leptospira in the urine. *W. F. Harvey.*

BEZEMER (F.). De ziekte van Weil op Celebes. [**Weil's Disease in Celebes.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Sept. 12. Vol. 73. No. 19. pp. 1194–1203. With 1 map.

An account is given of five cases of Weil's disease in Celebes with two deaths and with the typical quartet of symptoms—fever, jaundice, enlargement of spleen and haemorrhagic nephritis. Leptospiras were isolated, pathogenicity established in the guineapig and serum tests shown to be positive. These are the first cases to be described in Celebes. *W. F. Harvey.*

RUYS (A. Charlotte). Het aantoonen van *Leptospira icterohaemorrhagiae* in bloed met behulp van tweevoudige centrifugatie. [**Demonstration of *Leptospira icterohaemorrhagiae* in Blood by Double Centrifuging.**]—*Nederl. Tijdschr. v. Geneesk.* 1933. Aug. 12. Vol. 77. No. 32. pp. 3654–3658. English summary (5 lines).

Weil's disease may be difficult to diagnose clinically even with spirochaetes present in the blood. The diagnosis, however, is at once established by the demonstration of the spirochaete itself. Experiments are here given which were devised to find the best anticoagulant for the blood, the best speed at which to centrifuge, and the buffer reaction which gave the best results.

The final method arrived at was :—

(1) Centrifuge for 15 mins. at 1,500 revolutions 4½ cc. test blood in ½ cc. 1 per cent. sod. oxalate made up with the buffer solution—sod. hydrogen phosphate 9·45 ; pot. dihydrogen phosphate 0·55. (2) Examine a drop of the clear supernatant plasma by dark field with an objective C (x 20) without coverglass or with an objective D (x 40) with a coverglass for living spirochaetes. (3) Mix equal quantities of the plasma and a buffer solution of pH 5·3 (Disod. hydrogen phosphate 0·25 ; pot. dihydrogen phosphate 9·45). (4) Centrifuge 30 mins. at 3,000 revolutions. (5) Examine the sediment under a coverglass with objective D for spirochaetes.

W. F. Harvey.

BASILEWSKY (B. G.). Ueber die Bedeutung des Wassers und der Ratten in der Epidemiologie der ikterohämorrhagischen Spirochätose. [**Relative Significance of Water and Rats in the Epidemiology of Spirochaetal Jaundice.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Oct. 6. Vol. 129. No. 7/8. pp. 502–505.

The author attempted to infect guineapigs with various strains of leptospira isolated from the water in the province of Kiev. All experiments gave negative results, although, in addition to normal animals, one series comprised 23 splenectomized guineapigs, in which blockage of the reticulo-endothelial system had also been made.

On the contrary, 30·7 per cent. of 91 wild rats were found to be infected with a leptospira pathogenic to guineapigs. Therefore the author considers that the rat is the important epidemiological factor in human cases of Weil's disease. *E. H.*

UHLENHUTH (P.) & ZIMMERMANN (E.). Die weisse (zahme) Ratte als Ueberträgerin des Erregers der Weilschen Krankheit (*Spirochaeta icterogenes*). [**The White Rat as a Carrier of the Infective Agent of Weil's Disease** (*S. icterogenes*).]—*Deut. Med. Woch.* 1933. Sept. 8. Vol. 59. No. 36. pp. 1393–1395.

White rats are found to be susceptible to infection with *S. icterohaemorrhagiae* in the same way as wild rats.

Infection in white rats as a rule seems to be the result of contact with infected wild animals and in one experiment where three infected wild rats were placed in the same cage as six tame rats, one of the latter became infected, whilst five remained negative. Seven serologically positive wild rats were kept with six negative ones, and after 10½ weeks two of the latter had become infected whilst four remained negative. It is possible for man to acquire the infection

from white rats and a case is described in which a laboratory attendant was bitten by an infected white rat and subsequently developed an attack of Weil's disease. *E. H.*

PETZETAKIS (M.). Ueber die Empfänglichkeit der Feldmaus für die Icterogenes-Spirochäten. [**The Susceptibility of the Field Mouse to Spirochaetal Jaundice.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. July 11. Vol. 129. No. 1/2. pp. 41–42. With 3 text figs.

Contrary to general opinion, the author finds that the field mouse is very susceptible to infection with *Spirochaeta icterohaemorrhagiae.*

Two individuals inoculated with 2 cc. of a suspension of blood and organs from an infected guineapig died of the infection within 2 days. When the dose was halved, two inoculated animals died after 4 and 5 days respectively, and when the dose was yet further reduced, after 5 and 6 days. The latter all showed a rise in temperature followed by terminal hypothermy. Jaundice was present at death and petechial haemorrhages in the lungs. Spirochaetes were observed in the liver and kidneys. *E. H.*

THIRY (U.). Chimiothérapie des leptospiroses spontanée et provoquée chez la souris blanche. [**The Chemotherapy of Spontaneous and Induced Leptospirosis in White Mice.**]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 172–174.

Sixty white mice, some spontaneously infected with the Ghent mouse strain and the others with a chronic strain of *Spirochaeta icterohaemorrhagiae,* have been treated by means of various therapeutic substances. Favourable results were obtained with bismuth and with gold and sodium thiosulphate.

The animals were found to withstand relatively high doses of bismuth, and also of arsenic, antimony and gold, but oily suspensions were only absorbed with difficulty. Salts of arsenic and antimony were found to have little or no influence on the infection. Bismuth salts were efficacious in moderate doses, for a single injection of an aqueous suspension of 0·5 cgm. bismuth oxychloride caused the spirochaetes to disappear from the urine within 3 days. Mice readily withstand a dose of 4·0 cgm. of this compound. Favourable results were also obtained with an aqueous solution of the thiosulphate of gold and sodium. The *dosis tolerata* of this compound is at least 0·8 cgm., and a quarter of this was sufficient to cure the mice within two or three days. No differences were observed between the two kinds of infections either *in vitro* or in their response to treatment in the mouse. The favourable results obtained not only with bismuth, but also with gold and sodium thiosulphate, suggest the use of the latter compound in the treatment of human infections. *E. H.*

CLEYNDERT (P. C.), Jr. Spirochaetosis Icterohaemorrhagica.—*Nederl. Tijdschr. v. Geneesk.* 1933. June 10. Vol. 77. No. 23. pp. 2641–2647. English summary (4 lines).

DINGER (J. E.). Een geval van de ziekte van Weil te Batavia met enkele opmerkingen naar aanleiding van den daarbij geisoleerden leptospirenstam.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Mar. 28. Vol. 73. No. 7. pp. 402–407.

KLARENBEEK (A.) & SCHÜFFNER (W. A. P.). Het voorkomen van een afwijkend leptospira-ras in Nederland.—*Nederl. Tijdschr. v. Geneesk.* 1933. Sept. 16. Vol. 77. No. 37. pp. 4271–4276. English summary (5 lines).

KRAMER (P. H.). De ziekte van Weil zonder icterus.—*Nederl. Tijdschr. v. Geneesk.* 1933. June 10. Vol. 77. No. 23. pp. 2652–2667. With 6 figs. (2 on 1 plate). French summary (7 lines).

MEDULLA (Candido). Sopra un caso di malaria terzana semplice recidiva complicata a febbre ittero-emoglobinurica.—*Arch. Ital. Sci. Med. Colon.* 1933. July 1. Vol. 14. No. 7. pp. 433–441. With 1 chart. [20 refs.] English summary (4 lines).

RAGIOT & DELBOVE. Spirochètose ictéro-hémorragique bénigne.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1933. Jan.–Feb. Vol. 11. No. 1. pp. 16–19.

RAT-BITE FEVER.

SCHÖBL (Otto), HIRANO (H.), VAZQUEZ-COLET (Ana), RAMIREZ (José) & ARIMA (S.). **Study concerning Rat-Bite Fever in Manila, Philippine Islands.**—*Philippine Jl. Sci.* 1933. May. Vol. 51. No. 1. pp. 1–67. With 10 plates & 18 figs.

A detailed account of rat-bite fever in Manila, including a comparative analysis of the distribution of rat-bite fever and that of plague.

During the year 1931–1932, eleven strains of *Spirillum minus* were isolated from patients suffering from the disease and resident in Manila. Spirilla from the blood of infected guineapigs were found to survive 8 hours *in vitro*, but were never viable 24 hours or more after the blood had been removed from the infected animals.

The clinical manifestations of the disease in Philippine monkeys varied mainly according to the method of inoculation, but typical cases showed an initial local manifestation, then regional dissemination, followed by general manifestations, fever and exitus. After intradermal inoculation the primary local lesion develops in a few days. This lesion persists for some time, starting as an elevated induration which soon becomes surrounded by an oedematous area of a characteristic purplish-blue tinge. Eventually the primary lesion heals without scars. The subsequent dissemination of the infection followed the lymphatic system and among general manifestations noted were fever, general lymphadenitis and diarrhoea.

In guineapigs and rabbits the general lesions were more varied than in the monkey and for experimental studies there is no advantage in using monkeys. The presence of spirilla in the circulating blood of infected monkeys was intermittent and they are so rare that in no case were they detected by dark ground examination, but only by inoculation into guineapigs and white mice. After about 2 months the blood became negative. In guineapigs the spirilla could be seen microscopically in the blood after 8 to 39 days' incubation period. They could be found, however, at the site of the local lesion on the first day of its development and the periphery showed more spirilla than the centre.

Infected guineapigs were treated with various drugs, and satisfactory results obtained with neosalvarsan and stibosan. A human patient was treated with stovarsol and another with stibosan; both drugs

were found to be effective, but the second patient after being apparently cured, developed a relapse and was finally given stovarsol.

A characteristic leucocyte reaction accompanies an attack of the disease. The reaction consists of leucocytosis, due mainly to an increase of polymorphonuclears, but also to the increase of "staff-nucleated" leucocytes and concomitant lymphocytopenia. The leucocytic reaction coincides with the rises in temperature.

Immunity was studied by means of superinfection, that is, by the inoculation of infected animals, and also by the reinoculation of treated animals. The immunity is said to be analogous to that in syphilis and yaws. The course of the disease in super-infected animals was more rapid, and in half the animals enormous numbers of spirilla were found in the circulating blood when super-infection was performed within seven weeks of the original inoculation. When treated animals were exposed to reinfection certain clinical signs were altered. The initial lesion was smaller and healed more quickly, and in highly immune animals failed to develop, and fever was either slight or absent. Such animals, however, always contained spirilla in the internal organs, but these could only be detected by subinoculation into normal animals.

Attempts were made to determine whether there was any intra-uterine transmission of infection or immunity. Four litters of young white mice from three infected mothers, two of which contained spirilla in the blood at the time of delivery, showed no signs of infection or immunity. Similarly foetuses of infected guineapigs also showed no spirilla. Attempts to transmit the disease by the direct contact of normal and healthy guineapigs gave negative results, but normal guineapigs bitten by infected ones developed typical lesions and died of the disease.

Finally the authors discuss the relation between the distribution of human plague and rat plague in Manila during 1912–14 and the distribution of human cases of rat-bite fever in 1931-32. A complete agreement was found to exist between the two as regards the districts affected and it is suggested that a plan of attack against rat plague may be based on the recurrence of the two rat-borne diseases in the same localities of the city. *E. Hindle.*

Le Chuiton (F.) & Moureau (M.). Production de périorchite et d'orchite chez le cobaye par injection intrapéritonéale d'une souche humaine de sodoku japonais. [**Production of Periorchitis and Orchitis in the Guineapig by the Intraperitoneal Injection of a Human Strain of Japanese Sodoku.**]—*C. R. Soc. Biol.* 1933. Apr. 27. Vol. 112. No. 14. pp. 1380–1381.

The authors inoculated six guineapigs with a Japanese strain of *Spirillum minus*, which is said to be more virulent than the Bordeaux strain, in order to determine whether the periorchitis was due to these organisms alone, or to a simultaneous injection of rat typhus. The results show that *S. minus* infection in the guineapig may produce not only periorchitis, but also orchitis with congestion and a monocytic inflammation.

The Meinicke reaction was strongly positive in 3 guineapigs, slightly positive in one, and negative in one. The Kahn reaction strongly positive in one, feebly positive in two, and negative in one. *E. H.*

GUPTA (B. M. Das) & CHATTERJEE (S. N.). **Experimental Studies with a Spirillum found in the Nasal Cavity of Some Lepers.**—*Indian Med. Gaz.* 1933. Aug. Vol. 68. No. 8. pp. 453–455. With 2 charts & 4 figs. on 1 plate.

Spirillum minus was found by the authors in the nasal smears of four cases of leprosy out of over 3,000 examined.

The nature of the spirillum was proved by the inoculation of nasal scrapings into mice and guineapigs, which both showed generalized infections, and two human volunteers inoculated with the blood of infected mice developed typical symptoms of rat-bite fever. In turn mice were infected from the blood of both volunteers. It is suggested that the patients had been bitten by rats during sleep on anaesthetic spots without being aware of it. *E. H.*

VENOMOUS SNAKES AND SNAKE VENOMS. I*.

In the period under review local ophidian surveys have been made in several countries. Thus, CORKILL[1] reports that in Iraq five out of a total of twenty-four species are dangerous to man; these are the hook-nosed snake, *Enhydrina schistosa*, the hoodless cobra, *Naia morgani*, and three vipers—*Vipera lebetina*, *Cerastes cornutus* and *Echis carinatus*. Five out of fifteen bites by *V. lebetina* were fatal. KOPSTEIN[2] states that there are eleven poisonous land snakes in Java, three of which belong to the Viperidae and eight to the Proteroglyph Colubrids (sub-family Elaphinae); occasional fatalities are recorded. Of the sixteen sea-snakes little is known regarding their lethality to man. SMART[3] in an article on the commoner poisonous snakes in Malaya points out that only six deaths have been reported there during the last four years.

Laboratory Studies on Snake Venoms.

The typical mode of death in mammals poisoned by Colubrid venoms is by asphyxia resulting from failure of respiratory movement, and this result, despite evidence to the contrary, has been widely attributed to a direct action of such venoms upon the respiratory centre.

(1) *The Peripheral* versus *the Central Action of Venom.*—ROGOTI in 1891 expressed the view that the fatal asphyxia in Colubrid bites resulted from a peripheral curari-like paralysis of the muscles of respiration, and this hypothesis was subsequently upheld by ARTHUS, CUSHY and YAGI and HOUSSAY and his colleagues. ESSEX and MARKOWITZ have conclusively demonstrated the peripheral action of certain of the viperine venoms and recent papers emanating from the Hall Research Institute, Melbourne, support the peripheral action of the Australian colubrid venoms which to date have been investigated. Thus, KELLAWAY and HOLDEN[4] find that all the common Australian snake venoms possess a curarizing action on the frog which is easily demonstrated in isolated nerve-muscle preparations, but less readily in the intact animal. The action resembled that of curari in respect of the charges produced in direct and indirect chronaxie.

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*Previous reviews of current literature on this subject, by the late Lt.-Colonel A. ALCOCK, appeared in the Medical Zoology Section in this *Bulletin*, 1932, Vol. 29, at pp. 169–73 and 852–4.

[1] CORKILL (Norman L.). An Inquiry into Snake-Bite in Iraq.—*Indian Jl. Med. Res.* 1932. Oct. & 1933. Jan. Vol. 20. Nos. 2 & 3. pp. 599–625; 679–696. With 5 plates & 1 map. [43 refs.]

[2] KOPSTEIN (Felix). Die Gifttiere Javas und ihre Bedeutung für den Menschen.—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1932. Vol. 21. No. 4. pp. 222–256. [Refs. in footnotes.]

[3] SMART (A. G. H.). A Short Synopsis of Some of the Commoner Malayan Snakes, with Special Reference to the Venomous Snakes.—*Malayan Med. Jl.* 1932. Dec. Vol. 7. No. 4; & 1933. Mar. Vol. 8. No. 1. pp. 118–124; 49–59. [14 refs.]

[4] KELLAWAY (C. H.) & HOLDEN (H. F.). The Peripheral Action of the Australian Snake Venoms. I. The Curari-like Action on Frogs.—*Australian Jl. Experim. Biol. & Med. Sci.* 1932. Sept. 16. Vol. 10. Pt. 3. pp. 167–179. [15 refs.]

KELLAWAY, CHERRY and WILLIAMS[5] next investigated whether this curarizing action was present in mammals, whether or no it constituted the predominant cause of respiratory failure, and whether there was any evidence of direct action of venoms upon the central respiratory mechanism. In rabbits and cats faradic stimulation of the phrenic nerve and of the diaphragm itself shortly after respiratory failure revealed curarization with seven out of eight Australian venoms at a time when the heart was beating strongly and the blood pressure well maintained under artificial respiration. The venom of *Pseudechis australis* constituted the one exception; it caused death by direct action on heart muscle. The question of the relative merits of central and peripheral action in causing fatal respiratory failure was investigated in animals by an ingenious method depending on the application to the phrenic nerve of non-polarizable electrodes, which were connected to capacity amplifiers in such a manner that a clearly audible record of any descending motor impulses in the nerve was obtained by the loud speaker. By this means it was clearly shown in rabbits that the Colubrid venoms kill by their curarizing effects.

In considering the evidence on which the older views of central respiratory failure were based, the authors point out that the initial acceleration in rate and increase in depth of respiration may be otherwise explained than by the primary stimulation preceding secondary failure, that the concentration of dry venom used by ELLIOT when he applied it to the floor of the 4th ventricle was incomparably greater than that which occurs under natural conditions, and that the histological changes in the central nervous system described in Australia by KILVINGTON and by LAMB and HUNTER in India were probably attributable to asphyxia, and not to neurotoxin. The experiments of KELLAWAY and colleagues in which venom in moderate concentration was applied to the floor of the 4th ventricle suggested that though venom in lethal dosage had some action on the central respiratory mechanism, which might be indirect and due to local vaso-constriction, this central action played no important part in respiratory failure following the injections of venoms. KELLAWAY[6] also investigated the reversibility of the curari-like action for the venoms of the tiger snake (*Notechis scutatis*) and the copper-head (*Denisonia superba*) using monovalent antivenenes prepared by the Commonwealth Serum Laboratories. It was found that while curarization with these venoms was reversible, the reversibility was more difficult to demonstrate than in the case of cobra venom which possesses a more predominantly curari-like action. ISWARIAH[7] in correspondence disagreed with the views expounded by KELLAWAY[8] maintaining that with Indian cobra venom death was definitely due to central and not to peripheral respiratory paralysis, as pointed out by ROGERS.

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[5] KELLAWAY (C. H.), CHERRY (R. O.) & WILLIAMS (F. Eleanor). The Peripheral Action of the Australian Snake Venoms. 2. The Curari-like Action in Mammals.—*Australian Jl. Experim. Biol. & Med. Sci.* 1932. Sept. 16. Vol. 10. Pt. 3. pp. 181–194. With 1 fig. [30 refs.]

[6] KELLAWAY (C. H.). The Peripheral Action of the Australian Snake Venoms. 3. The Reversibility of the Curari-like Action.—*Australian Jl. Experim. Biol. & Med. Sci.* 1932. Dec. 16. Vol. 10. Pt. 4. pp. 195–202.

[7] ISWARIAH (V.). Snake Venoms. [Correspondence.]—*Brit. Med. Jl.* 1933. Aug. 12. p. 315.

[8] KELLAWAY (C. H.). Some Peculiarities of Australian Snake Venoms.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. June 29. Vol. 27. No. 1. pp. 9–21. [36 refs.]

(2) *Snake Venom Haemolysis.*—KELLAWAY and WILLIAMS[9] found the Australian snake venoms fell into two groups: those like black snake and copper-head venom which haemolyse directly without serum activation, and those like death adder and tiger snake venom which have only a negligible action on washed cells. In another communication[10] the peculiarities and the nature of haemolysis were studied. Haemolysis with Australian venoms proved essentially similar to that of other venoms, and depended upon a lecithinase acting at the limiting surface of the corpuscle; it was subject to the same ionic influences at this interface as haemolysis by cobra venom. Complement played an insignificant rôle in the haemolysis, but inhibition by serum was a frequent phenomenon and was not constantly associated with diminution of the swelling of the cells which normally precedes venom haemolysis.

VILLARD and MIGUELOTE-VIANNA[11] studied *in vivo* the changes in the blood of dogs following the injection of *Lachesis atrox* venom. Loss of coagulability was attributable to the action of venom proteases on fibrinogen and was found to be entirely independent of antithrombins though these were definitely increased. Following intravenous injection there was an initial diminution in the natural haemolytic power of the serum due to destruction of complement, secondly, a phase of enhanced haemolytic action lasting one-quarter to six hours due to the activation of the blood phosphatids by the venom, and finally, a phase in which the blood completely lost its haemolytic properties and became anticomplementary; during this last phase venom disappears from the circulation and the blood again becomes spontaneously coagulable. Various hypotheses to explain these phenomena were discussed.

(3) *Other Pharmacological Studies.*—KYU[12] studied the pharmacological properties of venoms of two of the crotaline snakes of Formosa—*Trimeresurus macrosquamatus* and *Trimeresurus gramineus*—injected into frogs, mice and rabbits; the lethal dose on subcutaneous injection in mice proved to be 0·005 mgm. per 1 gram body weight, and 1·0 and 5·0 mgm. per kilo respectively for the rabbit. IWASE[13] investigated *Naia naia atra* poisoning in *Rana tigerina*, the mouse and the rabbit. Death resulted by respiratory paralysis, the heart continuing to beat for some little time after complete cessation of respiration. The minimum lethal dose for rabbits was 0·1 to 0·5 mgm. per kilo.

[9, 10] KELLAWAY (C. H.) & WILLIAMS (F. Eleanor). Haemolysis by Australian Snake Venoms. I. The Comparative Haemolytic Power of Australian Snake Venoms. 2. Some Peculiarities in the Behaviour of the Haemolysis of Australian Snake Venom.—*Australian Jl. Experim. Biol. & Med. Sci.* 1933. June 16. Vol. 11. Pt. 2. pp. 75–80. [10 refs.]; 81–94. [23 refs.]

[11] VELLARD (J.) & MIGLUELOTE-VIANNA (M.). Modifications sanguines provoquées *in vivo* chez le chien par le venin de *Lachesis atrox.*—*Ann. Inst. Pasteur.* 1932. Oct. Vol. 49. No. 4. pp. 445–472. With 14 figs.

[12] KYU (Kenten). Toxikologische Untersuchungen ueber die Gifte der Crotalinae Formosa's. I. Mitteilung. Studien ueber das Gift von *Trimeresurus mucrosquamatus*, Cantor. II. Mitteilung. Studien ueber das Gift von *Trimeresurus gramineus*, Shaw.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. June. Vol. 32. No. 6 (339). [In Japanese. German summaries pp. 79–80; 84–85.]

[13] IWASE (Y.). Ueber die toxikologischen Wirkungen des Naja-naja-atra-Giftes. —*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. May. Vol. 32. No. 5 (338). [In Japanese. German summary pp. 57–59.]

BAYER and ELBEL[14] reviewed the work of FAUST who holds that the active principles of certain snake venoms are sapotoxins, but their experiments did not support FAUST's hypothesis. MACHT and DAVIS[15] exposed four venoms to ultra-violet radiations from a mercury vapour quartz lamp ; rapid deterioration in potency resulted as measured by their toxicity for mice and *Lupinus albus* seedlings.

(4) *Fractionation of Venoms.*—HOLDEN[16] who had previously investigated the results of fractionation of death adder venom (*Ancanthopis antarcticus*) by extraction with 45 per cent. ethyl alcohol, now reports the production of thrombin-free fractions of the venoms of the tiger (*Notechis scutatis*), the black tiger snake (*Notechis scutatis* var, *niger*) and the black snake (*Pseudechis porphyriacus*). Various grades of pyroxylin membranes were first tested by filtration at low and moderate pressures, but the results were disappointing. Then MARTIN's method of differential ultra-filtration under high pressure through gelatine membranes supported on filter candles was tried, the original apparatus employed by MARTIN in 1896 being actually used in the experiments ; a reasonable yield of venoms minus practically all its thrombin was obtained, but large enough amounts could not be produced by this means. Experiments with various adsorbents were next instituted, and freshly precipitated barium carbonate was found much the most effective ; by means of it as much as 99·9 per cent. of thrombin was removed from certain venoms.

IWASE[17] describes two main constituents in *Naia naia atra* venom. The main component A, which was precipitated by complete saturation with ammonium sulphate, constituted 9 to 11 per cent. of the venom, and caused motor and respiratory paralysis in mice, while component B, which was precipitated by 38 to 60 per cent. ammonium sulphate, constituted 60 to 80 per cent. of the whole venom and produced local effects on injection into mice. The virulence of both components was much reduced by digestion with trypsin so both were considered to be of an albuminoid nature. The result of immunization experiments with these two components A and B are discussed in another paper[18] ; rabbits were easily immunized with component A, but not with B, and the serum B-immunized rabbits precipitated and neutralized both B and A components, whereas sera of A-immunized animals neither precipitated nor neutralized the B component. The author concludes that for the preparation of an immune sera against

[14] BAYER (G.) & ELBEL (H.). Zur Frage der Saponinnatur der Schlangengifte—. *Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 78. No. 1/2. pp. 82–85.

[15] MACHT (David I.) & DAVIS (Mary E.). Effect of Ultra-violet Rays and of Methylthionine Chloride and Heparin on Snake Venoms.—*Proc. Soc. Experim. Biol. & Med.* 1933. Apr. Vol. 30. No. 7. pp. 990–993.

[16] HOLDEN (Henry Francis). The Fractionation of Australian Snake Venoms. 2. The Venoms of the Tiger Snake (*Notechis scutatis*), Black Tiger Snake (*Notechis scutatis* var. *niger*), and Black Snake (*Pseudechis porphyriacus*).—*Australian Jl. Experim. Biol. & Med. Sci.* 1933. Mar. 16. Vol. 11. Pt. 1. pp. 1–7.

[17] IWASE (Y.). Ueber die Isolierung der toxischen Komponenten im Naja-naja-atra-Gift.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Apr. Vol. 32. No. 4 (337). [In Japanese. German summary pp. 50–51.]

[18] IWASE (Y.). Immunologische Untersuchungen ueber die wichtigeren Schlangengifte in Formosa. III. Bericht ; Immunogenität der fraktionierten Komponenten des Naja-naja-atra-Giftes und Beziehungen zwischen Antitoxin- und Präzipitinwert.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. May. Vol. 32. No. 5 (338). [In Japanese. German summary pp. 59–60.]

Naia naia atra it is advisable to use the less toxic fraction B because the mortality is less and it is possible to obtain more potent anti-serum than with either fraction A or whole venom.

(5) *Sterility of Snake Venom.*—KELLAWAY and WILLIAMS[19] investigated three samples of a commercial preparation of modified viperine venom put on the market for the treatment of epilepsy; they isolated three sporulating organisms, *B. subtilis*, *Vibrion septique* and a bacillus resembling *Bacillus cochlearius*. The authors emphasize that special precautions are necessary to insure and maintain the sterility of any snake venom to be inoculated into man for therapeutic purposes.

Antivenenes.

Though the claims of the French school regarding the universality of the curative properties of the *sérum antivenimeux* introduced by CALMETTE in 1894 were not subsequently upheld, the specific neutralizing properties of antivenene when employed against the venom used in its production have been universally recognized. BRAZIL and others have also shown that with certain monovalent antivenenes, the serum obtained by inoculating venom from one species of snake may possess some neutralizing effect, though in less degree, on the venoms of other snakes which are, as a rule, closely zoologically related. SCHLOSSBERGER and MENK[20] have recently investigated the effects of venom antivenom inoculation in white mice, testing the venoms of numerous species of European venomous snakes against four different antivenenes—the Paris *sérum antivenimeux* E.R., two monovalent antijararaca sera and a polyvalent antibothrops serum (serum Wien). Cross protection was demonstrated to a variable degree. Thus the Paris serum E.R. prepared with *Aspis* and *Pelias* venom showed a well marked neutralizing power with certain venoms of the genera *Pelias*, *Mesovipera* and *Coluber*. With the vipers belonging to the genus *Mesocoronis*, however, serum E.R. possessed little or no neutralizing power, whereas serum Wien was effective, though of little use for the venomous genera *Pelias* and *Mesovipera*.

(1) *Detoxication of Antivenenes.*—The great toxicity of ophidian venoms has made the production of specific high titre antivenenes from horses a prolonged, hazardous and decidedly expensive affair so that any process such as detoxication of venom with simultaneous preservation of its antigenic properties becomes a matter of great practical importance to countries interested in the manufacture of antivenenes on a large scale. During the period under review GRASSET and ZOUTENDYK[21,22,23] of the South African Institute of Medical Research

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[19] KELLAWAY (Charles H.) & WILLIAMS (F. Eleanor). The Investigation of the Toxicity and Sterility of a Commercial Preparation containing Modified Snake Venom.—*Med. Jl. Australia.* 1933. May 13. 20th Year. Vol. 1. No. 19. pp. 581–586. With 6 figs.

[20] SCHLOSSBERGER (H.) & MENK (W.). Experimentelle Untersuchungen ueber die Serumbehandlung der Bisse europäischer Giftschlangen.—Reprinted from *Festschrift f. Dr. Emil Burgi, Bern, 1932.* p. 296. [11 refs.]

[21] GRASSET (E.) & ZOUTENDYK (A.). Méthode rapide de préparation de sérums antivenimeux polyvalents—antivipéridés et cobras—au moyen des anavenins formolés.—*C. R. Soc. Biol.* 1932. Nov. 4. Vol. 111. No. 33. pp. 432–434.

[22] GRASSET (E.) & ZOUTENDYK (A.). Sur la vitesse d'apparition de l'immunité et des anticorps antivenimeux vipéridés et cobras, chez les animaux vaccinés par les anavenins formolés.—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1455–1457.

have written several papers dealing with detoxication of snake venoms and rapid methods of antivenomous vaccination and serum production. A number of venoms were subject to detoxication by bile, solganal—an organic gold preparation, and formalin, the relatively atoxic venom derivatives being subsequently used for immunization experiments in animals. Concentrated solutions of viperine venoms dissolved in saline and colubrine venoms dissolved in broth were readily detoxicated at 37°C. by means of formalin, the atoxic derivatives being highly antigenic. Domestic animals and donkeys were actively vaccinated by a course of three or four subcutaneous injections. By the hyper-immunization of horses both monovalent and polyvalent antivenenes of exceptional potency were obtained in a few weeks with ease and safety.

(2) *Concentration of Antivenenes.*—In snake bite, the biting snake frequently remains unidentified, and in countries where numerous poisonous species abound resort to a polyvalent antivenene has proved necessary. Polyvalent antivenenes, however, are very bulky for intravenous and intramuscular use, and in consequence some method of increasing their potency by concentration, such has been successfully applied to the manufacture of antivenenes in Brazil, South America and the United States, becomes highly desirable. In 1929 a polyvalent antivenene was produced at the South African Institute of Medical Research, and utilizing a modification of the Brunner-Pincknus process employing sodium sulphate precipitation and subsequent dialysis to obtain the purified pseudo-globulin fraction of the serum, GRASSET[24, 25] reports the production of a two-fold concentration of antivenom serum against African Viperidae and Colubridae, 1 cc. of which neutralizes either 10 mgm. *Bitis* venom or 1·8 *Naia* venom. MAITRA, NAIDU and AHUJA[26] record a still further improvement with the sodium sulphate method whereby the loss of unitage did not exceed 20 per cent.; a three-fold concentration of the Kasauli polyvalent venom was obtained so that 1 cc. of the concentrated product neutralized 3·0 mgm. of daboia and 1·5 mgm. of cobra venom. Provided the potency of this concentrate is maintained for a year under ordinary conditions of storage, the authors think the method should be suitable for the manufacture in India of a potent purified antivenene on a large scale. For technical details the original papers should be consulted by those interested.

(3) *Treatment with Antivenenes.*—DO AMARAL[27] stresses the important fact that snake poisoning is much more severe in children

[23] GRASSET (E.) & ZOUTENDYK (A.). Detoxication of Snake Venoms, and the Application of the Resulting Antigens to Rapid Methods of Antivenomous Vaccination and Serum Production.—*Brit. Jl. Experim. Path.* 1933. Oct. Vol. 14. No. 5. pp. 308–317. [11 refs.]

[24] GRASSET (E.). Concentration of Polyvalent African Antivenom Serum.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1932. Nov. 30. Vol. 26. No. 3. pp. 267–272. [15 refs.]

[25] GRASSET (E.). Concentrated African Antivenom Serum: its Preparation, Standardization and Use in the Treatment of Snake-Bite.—*South African Med. Jl.* 1933. Jan. 28. Vol. 7. No. 2. pp. 35–39.

[26] MAITRA (G. C.), NAIDU (B. P. B.) & AHUJA (M. L.). Concentration of Antivenomous Serum.—*Indian Jl. Med. Res.* 1933. July. Vol. 21. No. 1. pp. 229–236.

[27] DO AMARAL (Afranio). Pontos de vista basicos na therapeutica do ophidismo.—*Mem. Inst. Butantan.* 1931. Vol. 6. pp. 243–249. English summary.

DO AMARAL (Afranio). O soro secco como cicatrizante das ulceras produzidas pelo veneno bothropico.—*Mem. Inst. Butantan.* pp. 253–265. With 2 figs. on 1 plate. English summary (6 lines).

and small animals, and that its severity—other things being equal—is inversely proportionate to the body weight of the victim. For this reason the volume of antivenene must be greatly increased if the patient be small. In cases of neurotoxic poisoning antivenene is advocated intravenously, whereas in venoms of proteolytic and haemorrhagic type the injection should be given locally into the tissues surrounding the fang punctures. The local application of dried normal serum is advocated for chronic ulcers resulting from snake bite. BESREDKA[28] also reports that local injection of antivenene is alone effective in the treatment of the cutaneous lesions following the experimental inoculation of viperine venoms in animals. GRASSET[25] found in sheep inoculated with Cape cobra venom that the longer serum treatment was delayed, the greater the dose of antivenene required to prevent death ; further, the application of a tourniquet enabled the effective dose of serum to be reduced by from one-half to one-third, its localizing influence compensating to a considerable extent for the aggravating factor of delay in treatment. LLOYD[29] in Australia reports the recovery of a patient bitten by a tiger snake and treated intravenously with 4,500 units of the new monovalent antivenene recently produced by the Commonwealth Serum Laboratories. Another case, a child aged 2 years, bitten by a death adder for which no antivenene is as yet available, succumbed within two hours.

*N. Hamilton Fairley.**

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[28] BESREDKA (A.). De la sérothérapie locale dans l'empoisonnement par le venin des vipères.—*C. R. Soc. Biol.* 1933. Feb. 3. Vol. 112. No. 4. pp. 345–347.

[29] LLOYD (C. Humphrey). Four Cases of Snake Bite.—*Med. Jl. Australia.* 1932. Sept. 17. 19th Year. Vol. 2. No. 12. pp. 360–361.

* Summaries of the German papers were made by Col. H. J. WALTON.

HELMINTHIASIS.

HEADLEE (W. H.). **Epidemiological Studies of Helminth Infections in an Egyptian Village. Soil Pollution and Soil Infestation.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 695–711. With 4 figs.

The epidemiology of helminthic infections was studied at Rushdy, a village with 76 inhabitants in the Nile delta 16 km. north and east of Cairo. This paper deals with part of the results obtained, namely defaecation habits, soil pollution and its infectivity, including the effects of climate and infection-favouring habits of the population.

The study extended from October to December and was repeated in May-June. Much care was expended in gaining confidence, co-operation and acquaintance with every inhabitant, so that even from a distance they could be identified through glasses by their familiar clothing. As a result there was obtained free access to the houses. At intervals there were periods of 6 consecutive days when every fresh stool was marked down and charted ; these varied in number from 21 to 53, and their positions indicated no fixed dejection sites. Indeed the men commonly used the fields and the banks and beds of canals and when the last were filled for irrigation, the possibility of the spread of schistosome infection is clear. The number of fresh stools found was far smaller in summer than in winter, for during wheat-cutting in summer the men were in the fields before their morning defaecation. For detecting soil infection, Baermann's apparatus was used for larvae and the Caldwell-Spindler technique for ova (this *Bulletin*, Vol. 27, p. 975). Of 101 soil samples, which varied in water content from 3·8 to 50·7 per cent., 12 taken during summer were negative. Of 56 samples from spots of known pollution, 2 contained hookworm, 2 others doubtful, larvae ; of 54 of them examined for eggs the findings were :—*E. vermicularis* 7, *Hymenolepis* sp. 4, ascaris 13 (1 unfertile), trichuris 1, hookworm 1, negative 32. Data regarding the other samples are not fully understood, but it is noteworthy that those from tops of 4 latrines all contained ova, namely ascaris 3, threadworm 2, trichuris 1. Habits as related to infective soil are discussed. The average annual rainfall for the area during 35 years is 34 mm. and the mean temperature in the months here concerned lay between 26·1 and 13·3°C. with maximum of 44·2 and 29·4°C. Stools were usually deposited in direct sunlight whose effect was increased by the way in which chickens scattered them about in the dust layer which covers all such spots. The beetles aid in their rapid disappearance. [A word of protest is permissible against the use of national spelling in the face of the existence of an internationally accepted Code of Zoological Nomenclature.]

Clayton Lane.

WIGAND (R.) & STEINER (F.). Weitere Untersuchungen ueber den Wurmbefall des Menschen am Kurischen Haff. [**Worm Incidence in Man on the Kurisches Haff.**]—*Deut. Med. Woch.* 1933. July 21. Vol. 59. No. 29. pp. 1119–1121.

Investigations at Schaaksvitte, on the southern shore of Kurisches Haff, are continued (see this *Bulletin*, Vol. 29, p. 404).

Infection with *Opisthorchis felineus* was confirmed. The following up of the population through a whole year showed that ascaris infection was greatest in the last quarter of the year corresponding, as in Panama, with a June acquisition ; this is correlated by the authors with grosser filth in house and person every summer, particularly in respect of those of school age. In 33 persons with diphyllobothrium, eosinophilia varied from 0 to 14, the cause of this variation being undetected. No connexion was traced between tuberculosis and the wandering of ascaris larvae. *C. L.*

MAHLER (K.). Die Beziehungen zwischen Helminthiasis und Frauenkrankheiten. [**Relations between Helminthiasis and Diseases of Women.**]—*Muench. Med. Woch.* 1933. Oct. 6. Vol. 80. No. 40. pp. 1543–1545.

Mahler is convinced of the frequency with which gynaecological symptoms are due to worms.

At Insterburg, East Prussia, 28·4 per cent. of 500 patients showed worm eggs in the faeces, 131 coming from labouring and 11 from business class circles and most women with symptoms and worm infection had few or no physical signs. He insists that helminthiasis has a much larger rôle in gynaecology than is generally recognized and that the recognition and removal of worms will often be followed by surprisingly good results. *C. L.*

GALLI-VALERIO (B.). Notes parasitologiques et de technique parasitologique. [**Notes on Parasitology and its Technique.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Sept. 8. Vol. 129. No. 5/6. pp. 422–433. With 1 fig. [15 refs.]

Among many notes on the geographical distribution of parasites is one recording the death of an extremely anaemic woman in the hospital of Elim, South Africa, no other cause being found than a mass of broad tapeworms. Though mature they were of small size, 24–40 cm. long, the mature segments measuring 4 mm. long by 2 mm. broad, the central rosette containing ovoid, yellow, operculated eggs 60 by 45μ. They are considered to be *D. latum* var. *tenellum.*

Under " Risk from parasites in transit " are recorded 3 cases in which foxes ingested and disseminated viable eggs of *Ascaris lumbricoides.*

Under " Technique " is noted the fact that eggs of *D. latum* kept in water at room temperature since 29.xii.1907 still have their characteristic form although many have lost the operculum. *C. L.*

CLAPHAM (Phyllis A.). **Recent Researches on Helminth Immunity.**—20 pp. [67 refs.] 1933. Imperial Bureau of Agricultural Parasitology. Winches Farm Drive, Hatfield Road, St. Albans. [3s.]

The author discusses natural immunity and acquired immunity, including the immunity produced by previous infestation, that produced by treatment with dead worms and passive acquired immunity. She discusses also the association of nutrition and immunity and reaches the following conclusions :—

" It is obvious that animals exhibit immunity responses as a result of helminth infestation, even though the immunity so produced seems seldom to be absolute. But it is manifested in decreased egg production, inhibited growth and lowered survival rate of the parasites. Then too the changes that are induced in the blood serum and in the body fluids are frequently demonstrated by the positive reactions obtained in diagnostic tests—complement fixation reaction, precipitin test. These tests are outside the scope of this memorandum but, being intimately linked with the immunity responses of the host, they must not be forgotten. It is interesting to call to mind in this respect that these tests have been successfully applied in the diagnosis of helminth infestations in both man and animals in a large number of diseases. For instance not only do schistosomiasis, hydatid disease, ascariasis in the migratory stages, etc., all give positive reactions with one or more of these tests but also both precipitin and complement fixation tests, according to Hoffmann and Rivers (1929), are useful in diagnosing fascioliasis in sheep in which the immunity response has not yet been considered.

" In summarizing these results we are bound to notice how very much of the evidence is contradictory. This is probably due to the different standards and criteria that are adopted by individual workers. It is obvious also that much more accurate data are necessary before we are able to understand the basic principles underlying the subject."

C. L.

CARMAN (John A.). **Carbon Tetrachloride in the Treatment of Hookworm Disease and Taeniasis.**—*East African Med. Jl.* 1933. Sept. Vol. 10. No. 6. pp. 181–186. [24 refs.]

" Now that its pharmacology and limitations are more fully understood, carbon tetrachloride can be confidently prescribed with safety if given to the right person in the right way." And again, " If certain classes of patients are not treated and if certain precautions are taken to encourage elimination and discourage absorption, carbon tetrachloride is a perfectly safe anthelmintic."

In support of his attitude Carman cites the long series of cases by LAMBERT [100,000 consecutive treatments without a death, this *Bulletin*, Vol. 30, p. 691], O'BRIEN [225,000 treatments in dosage of 1·2 cc. with oil of chenopodium with 3 independent deaths, this *Bulletin*, Vol. 22, p. 895], and KHALIL [150,000 treatments with 5 cc. as adult dose and one death and he an opium addict, this *Bulletin*, Vol. 23, p. 779] ; but omits all reference to other very different experiences such as those summarized in the note to LAMBERT's paper (*l.c.*). The contraindications to this drug mentioned are alcoholism, recent anaesthesia, coincident ascaris infection [which necessitates microscopical examination in every case], consumption of fat or oil, calcium deficiency [which, too, should imply personal tests]. Carman urges that a saline dose should be given before the anthelmintic, so that intracellular fluids in the intestinal mucosa are drawn lumen-wards, and by thus causing a negative osmotic pressure render difficult any absorption from the lumen. In *Taenia saginata* infection this drug may, by directly killing the parasite, cause its digestion, so that there may be cure without passage of segments. The dose advised is 60 minims [4 cc.] for an adult man, with grading for women and children. It is

noted that this dose now holds the sanction of the British Pharmacopoeia [but not that almost all deaths have followed smaller ones].

C. L.

TOMB (J. Walker) & HELMY (M. M.). **The Toxicity of Carbon Tetrachloride and its Allied Halogen Compounds.**—*Jl. Trop. Med. & Hyg.* 1933. Sept. 15 & Nov. 1. Vol. 36. Nos. 18 & 21. pp. 265–270; 334–339. With 1 map in text.

The causes and treatment of poisoning by carbon tetrachloride are considered as displayed by 19 deaths in 1,600,000 persons treated for infection with *Ancylostoma duodenale* and *Ascaris lumbricoides* in the anthelmintic hospitals of the Department of Public Health of Egypt.

First are considered the chlorine substitution products of the aliphatic carbons of which chloroform, carbon tetrachloride, tetrachlorethylene and dichlorethane have been used as anthelmintics, and against all of which it is noted in a valuable table that they cause acute hepatic necrosis. A paper by G. M. FINDLAY on Toxic Jaundice is quoted in which the causes of liver damage are set out, as are certain factors which influence its extent under the heads nutrition, combined toxic action such as the synergic effect of chloroform and *Bact. coli*, or of the arsphenamines and some infective agent, or of pregnancy with a drug.

Regarding carbon tetrachloride "In the opinion of CHOPRA and CHANDLER (with which we entirely agree), the condition of the patient as regards nutrition, diet and the presence or absence of liver damage, has much more to do with the toxicity of the drug than has the size of the dose. . . . A single large dose (as in the case of turpentine) is much safer than repeated doses owing to diminished absorption." As to the suggestion that the toxicity of the drug depends on carbon bisulphide or hypothetical and unidentified sulphur derivatives, reasons are given for the conclusion that it lacks all scientific foundation.

Of the 19 fatalities (1 in 84,000) 6 were immediate and 13 delayed. Regarding the 6 immediate fatalities the intervals between administration and death, the question of purgation, and the results of autopsy were: (1) 20 minutes, atheroma of coronary arteries; (2) 6 hours, purge and enema ineffective, cirrhosis of liver; (3) 3 hours, vomited purge, no autopsy, given with oil of chenopodium; (4) 1½ hours, cirrhosis of liver, given with oil of chenopodium; (5) 6 hours, purge unsatisfactory, cirrhosis of liver, many ascarids in intestine at autopsy; (6) 6 hours, bowels could not be moved, no contributing cause at autopsy. In the first 5 of these, ascaris infection only was revealed by microscopic examination and they were presumably treated for that infection; in the last, *A. duodenale* only was found and in it the history sheet revealed many unsuccessful attempts at evacuation by purge, enema and pituitrin.

In the 13 delayed poisonings the interval between administration and death lay between 2 and 3 days. In 5 the effect of the purge was not known; 3 were treated for ascariasis, of whom one died jaundiced without autopsy and the others showed acute hepatic necrosis and, severally, greatly enlarged liver and spleen, and fatty heart and kidneys with jaundice; two were treated for ancylostomes, both had acute hepatic necrosis, one hydronephrosis and the other was so feeble that he could not walk. In 6 the purge was deemed to have acted unsatisfactorily, in 1 no autopsy was made, in 5 there was acute hepatic

necrosis and, severally, unevacuated intestines, caseating mesenteric glands, chronic nephritis (he being the only one of the 6 who had not ascariasis), intestine blocked with ascarids, failure of purgative in a man absconding from hospital who had also received oil of chenopodium. In the other 2 the purge acted well; one was treated for ascaris and died jaundiced without autopsy but with the note "clinical contraindication (malaria)," the second was treated for ancylostomes, had enlargement of liver and was very weak and ill.

"Since ascariasis is a contra-indication to the administration of carbon tetrachloride owing to the fact that in heavy infestations it is capable of causing mechanical obstruction to the action of the saline purgative through "clumping" of the worms in the intestines, it is now the routine practice in the anthelmintic hospitals of Egypt to administer a preliminary purge to all patients on the day on which they come for microscopical diagnosis and clinical examination. If found positive and clinically fit for treatment, they are directed to return on the following day, when, if they report that the preliminary purge has acted freely, carbon tetrachloride is administered in appropriate doses."

The dose used is 5 cc. (1 cc. for every 12 kilos), or, if a mixture of 1 to 3 of oil of chenopodium and carbon tetrachloride is used, 4 cc. (1 cc. for every 15 kilos). Stress is laid on a rich carbohydrate diet. "Since carbon tetrachloride must be regarded as a highly toxic drug if absorbed in therapeutic doses, it is particularly impressed on the staff of the anthelmintic hospitals that patients to whom carbon tetrachloride has been administered are to be regarded as in potential danger of death from poisoning by the drug until it has been completely evacuated from the intestinal canal." When symptoms of intoxication appear, intravenous injections of calcium gluconate are given, 30 cc. at once, and 20 cc. 3 hours later and thereafter every 4 hours as needful. The fatal effects of ascariasis are due, it is suggested, both to mechanical obstruction and to diminishing further the natural resistance either through toxins or by adding a burden to the bodily state already lowered by poor nutrition. The whole campaign is clearly based on an attempt to make an individual diagnosis and to maintain individual attention throughout treatment. *C. L.*

ANDERSON (T. Farnworth) & CAROTHERS (J. C. D.). **Two Fatal Cases of Poisoning with Male Fern.**—*East African Med. Jl.* 1933. July. Vol. 10. No. 4. pp. 122–123.

The dose of male fern given to both these adults for tapeworm, was ♏90 (6 cc.) and since other patients receiving the same dose from the same bottle were not incommoded, idiosyncrasy is suggested as the cause of death.

Case 1. The dose was followed by transient fever, persistent vomiting, pain in the back, urine bloody with blood casts and epithelial cells, paralysis of arms, and death. P.M.—Gastric mucosa congested, gall bladder contained light-brown fluid, kidneys pale and swollen.

Case 2. On November 22nd Ol. chenopodii ♏15 (1 cc.). On November 30th, after preliminary purge, the extract was given at 6.30 a.m. At 7 a.m. passed large quantity of tapeworm and blood; cold, shock, violent cramps in limbs, copious bleeding from gums, slight jaundice. At 1.30 p.m. coma, stertor, acetone in breath. Died 2.30 p.m. without rise in temperature. P.M.—Liver, spleen and kidneys intensely congested. Blood in kidney calices and bladder, and evidently suppression of urine of some hours duration. *C. L.*

MEERSSEMAN (F.), FRIESS (E.) & BERGONDI (J.). Un cas de distomatose hépatique à "Fasciola hepatica." Traitement par le tetrachlorure de carbone. [**Case of *F. hepatica* Infestation treated by Carbon Tetrachloride.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1933. July 17. 49th Year. 3rd Ser. No. 24. pp. 981–984.

The diagnosis of *F. hepatica* infestation was microscopically established, the treatment effective.

A married woman of 30 with a nine years' history of nausea, migraine, subicterus; later, biliary colic with frank jaundice, and an itching eruption on hands, feet and buttocks associated with both colicky and migrainous attacks. Duodenal intubation, undertaken for treatment, disclosed many eggs of *F. hepatica*, after which they were discovered sparsely in the faeces, and an eosinophilia of 23 per cent. was found. Biliary medical drainage and fouadin proved useless, as did agocholine and stovarsol. Carbon tetrachloride was given in dosage of 1 cc. daily for 5 days. After the 3rd dose there was a violent biliary colic, with intense bilious diarrhoea burning the anus, but the course of treatment was continued. Another course was put through after 10 days and was associated with a milder crisis, again on the 3rd day. After this, ova ceased to be found by duodenal tube and the woman had gained weight and looked well. However, about 2 months after the beginning of the first course of treatment she had 3 others of 1 cc. of carbon tetrachloride on each of 3 days, with a 5 days' interval between courses. Repeated examinations failed to find ova, and eosinophils fell to 3 per cent.

[In all, then, she had 19 cc. of carbon tetrachloride. The diagnostic technique though concentrative in effect, actually obtained the eggs before they were diluted by food.] *C. L.*

KRULL (Wendell H.). **New Snail and Rabbit Hosts for *Fasciola hepatica* Linn.**—*Jl. Parasitology.* 1933. Sept. Vol. 20. No. 1. pp. 49–52.

An investigation to determine the intermediate hosts of *F. hepatica* in the Rocky Mountain States.

"The snail *Fossaria modicella* Say has been determined experimentally to be a new secondary host of *Fasciola hepatica* Linn., and the cotton-tail rabbit, *Sylvilagus floridanus mallurus* (Thomas), to be a new primary host. Cercariae escaped from these snails which were subjected to infection when fully grown, in 32 days, but laboratory-raised snails infected when still small died before the cercaria-producing stage was reached. Laboratory-raised snails of the species *Succinea avara* Say and *Lymnaea* (*Galba*) *palustris* Müll. and an opossum, *Didelphys virginiana* Kerr, could not be infected." *C. L.*

JEPPS (Margaret W.). **Miracidia of the Liver Fluke for Laboratory Work.** [Correspondence.]—*Nature.* 1933. July 29. Vol. 132. No. 3326. p. 171.

A method of obtaining and developing eggs of *Fasciola hepatica*, held preferable to that of EALES (this *Bulletin*, Vol. 28, p. 199), is described.

Rinsings from the gall bladders of infected sheep are washed several times, preferably with slow centrifuging, till clear. The sedimented eggs are thinly spread in dishes containing tapwater and set aside, the water being changed as often as it becomes foul. Miracidia will be present in

2–3 weeks at 25°C., 6–8 weeks at 16°C. Half an hour before miracidia are required for demonstration or infection of *Limnaea truncatula*, hatching is brought about by placing a drop of sediment in a watchglass full of *cold* water. Hyperinfection of snails must be avoided if the snails are desired to survive. Though it is generally stated that this infection is seasonal, no difficulty has been met in obtaining viable eggs at any time in the academical year at Glasgow (October to June). *C. L.*

KHALIL (Mohammed). **The Life History of the Human Trematode Parasite** *Heterophyes heterophyes* **in Egypt.**—*Lancet.* 1933. Sept. 2. p. 537.

The life history of the trematode parasite of man, *H. heterophyes*, has been worked out in Egypt.

The opportunity of investigation was offered by an endemic centre at Lake Manzala, adjoining Port Said, where 53 of 60 school children were found infected. The snail *Pirenella conica* contains lophocercous cercariae, one type of which was induced to encyst in *Gambusia affinis* reared in the laboratory. In the muscles 15–20 days later were found metacercariae with the characteristics of those naturally found in the mullet, *Mugil cephalus* ; and three days after the infected gambusia had been fed to a young dog, born and reared in the laboratory, *H. heterophyes* of corresponding age was found in its intestine. The natural life history, then, is this—Passage of eggs into the water from many of 11,500 persons who operate the 1,325 fishing boats ; infection of the very common *P. conica* ; development of sporocysts, rediae and cercariae in it, maturing only during summer ; entrance of free cercariae into the mullet or into *Tilapia nilotica* ; the eating of these uncooked by man. Presumably the mullet is the main source of human infection, since it is commonly eaten salted ; for the metacercariae are found living in the salted fish up to 7 days, and it is eaten from the third day onwards. *C. L.*

ARCHIBALD (R. G.). **The Endemiology and Epidemiology of Schistosomiasis in the Sudan.**—*Jl. Trop. Med. & Hyg.* 1933. Nov. 15. Vol. 36. No. 22. pp. 345–348.

Its title shows the paper's scope.

Since an alarming spread of schistosomiasis in the Sudan took place with the importation of Egyptian labourers in 1918, it is concluded that this country was originally infected by the Egyptian invasion of 2600 B.C. and the Egyptian occupation as far south as Kerma in Dongola Province from 2000 to 1000 B.C., seeing that RUFFER's investigations on mummies have shown that the infection existed among Egyptians during these periods. The author's further conclusions are as follows :—

" Schistosomiasis occurs in eleven out of the fourteen provinces in the Sudan ; the vesical is the more common type in the northern Sudan, the greatest incidence occurring in males between the ages of 10 to 15 years. South of the Upper Nile Province intestinal schistosomiasis is the prevailing, if not the only, type.

" Infection is acquired during the months of the year when water is sufficiently shallow to permit of a high concentration of cercaria. In the case of inland lakes and water-courses, the seasonal incidence is from October to the end of January ; in the Nile backwaters, the danger period is usually February to June.

"Laboratory observations have shown that *Bullinus truncatus* (including the species *B. contortus*, *B. dybowskii*, *B. innesi*) is the intermediate host of *S. haematobium* and *Planorbis boissyi*, *P. pfeifferi*, *P. alexandrinus* and *P. herbeni* the intermediate hosts of *S. mansoni*.

"Infected Bullinus and Planorbis molluscs are capable of shedding schistosoma cercariae for periods as long as seventy-five and fifty-eight days respectively.

"Rapid desiccation readily kills Bullinus and Planorbis molluscs but in the drying-up of rain-water lakes and water-courses where the recession of the water is gradual, a certain number of molluscs are capable of aestivating in the subsoil for three to four months and so represent the seed stock for the following rainy season.

"Bovine schistosomiasis is fairly prevalent in the Sudan; the characteristic ova of *S. bovis* have not been found in the urine or faeces of natives of the Sudan." *C. L.*

TSYKALAS (D.). L'emetine contre les affections schistosomiques. [**Use of Emetine in Schistosomiasis.**]—Extract from *Pratique Médicale*. 1933. May. No. 8. 31 pp. With 7 figs. [Numerous refs.]

——. Décalogue de l'application de l'émétine.—Extract from *Ann. de E. Merck*. 1932. Pt. 3. 4 pp.

Tsykalas claims credit for the introduction of emetine treatment in schistosomiasis and gives notes of 3,800 cases.

The present year is the 20th anniversary of the introduction of emetine in the treatment of schistosomiasis. Tsykalas claims the credit of its introduction on 14th June 1913 (Comptes-rendus de la Section de Médécine du Syllogue Hellénique d'Alexandrie, Ptolémée I.).

Emetine: its physiology, dosage and toxicology based on 3,800 personal cases.—An outstanding point here is the claim that emetine is superior to every other specific. Its dosage should be 1·12 gm., intravenously in all, spread over 10 injections during a fortnight—the first four of 0·1, 0·12, 0·14 and 0·16 gm., and the others of 0·1 gm. He also describes an abortive treatment of 1·0 gm. composed of 0·1 on each of 10 consecutive days and claims for it a cure percentage of 90·5 comparing it with KHALIL's of 26 days 3 times a week with cure percentage of 32·5, FAIRLEY's 26 days also 3 times a week with 73·5 and the latter's 18 days daily of 100 per cent. of cures, the last two being experimental.

Attached to the reprint is an extract from Merck's *Annales*, 1932. Ten commandments in the use of emetine, of which, while there are none with promise, there are some with threat. They run something as follows:—

I. Give a total dosage of 1·25 gm. intramuscularly or 1 gm. intravenously. II. Spread it over 10–14 days. III. Begin with a big dose. IV. Give it every day. V. Regulate its size by body-weight and not by age. VI. Give it either intravenously or intramuscularly; it is immaterial. VII. Treat as soon as a diagnosis is made. VIII. Watch the heart; the risk lies there. IX. Leave two months between treatments. X. Let the emetine be pure. *C. L.*

ARCHIBALD (R. G.). **The Use of the Fruit of the Tree *Balanites aegyptiaca* in the Control of Schistosomiasis in the Sudan.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 207–210.

The widespread use of the fruit of *Balanites aegyptiaca*, and as a necessary preliminary the widespread culture of this tree, are believed to hold out good prospects for the control of schistosomiasis in tropical Africa, Arabia, Egypt and Palestine, these being the areas in which the tree grows naturally.

Experience in the Sudan has shown that schistosomiasis cannot be controlled there by measures directed to man only. Measures suitable for the irrigated Gezira (this *Bulletin*, Vol. 30, p. 207) are unsuitable for the West and South Sudan with their rainwater courses and rain ponds. The Arabs, in the arid west, resent chemical treatment of their only potable water, so a search was made for some tree shedding a fruit deadly for molluscs and harmless for man. It is believed that in *Balanites aegyptiaca* such a tree has been found. It fruits prolifically for 6 months annually, its date-like fruit with a bitter-sweet flavour is eaten with impunity, notably in the Upper Nile and Nuba Mountain districts. The berries, kernels, bark, roots and branches contain an active principle, probably a saponin (the bark is often used as a soap) which is deadly to molluscs, miracidia, cercariae, tadpoles and fish. For actual use the berry is advised ; one weighing 5·2 gm. suffices to kill bilharzial molluscs when soaked in 30 litres of water. The advised procedure is : add 35 berries (they average 7 but reach 14 gm. in weight) to a 4½-gallon petrol tin of water and stand overnight, next morning thoroughly crush the softened pulp in the water, stand for 24 hours more, add this quantity of suspension to a cubic metre of water. At this dilution the fluid kills all Bullinus and Planorbis in 12 hours and bilharzial miracidia and cercariae in one hour or less. This suspension is a cheap, efficient and evidently acceptable substitute for chemicals, and it may well be obtained naturally if there is dense afforestation of the borders of natural water collections at present infective. *C. L.*

ERFAN (M.). **Bilharziasis and Diabetes Mellitus.**—*Jl. Trop. Med. & Hyg.* 1933. Nov. 15. Vol. 36. No. 22. pp. 348–349. With 1 chart.

Although diabetes may be caused by schistosomiasis, such causation is rare.

Citing a case by DAY (this *Bulletin*, Vol. 21, p 938) Erfan reports another, of *S. mansoni* infection, whose cure by intravenous tartar emetic coincided with a fall of urinary sugar from 10 per cent. to zero. The man took the ordinary hospital diet throughout. *C. L.*

MACHATTIE (C.), MILLS (E. A.) & CHADWICK (C. R.). **Can Sheep and Cattle act as Reservoirs of Human Schistosomiasis ?**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 173–184. With 6 figs. on 1 plate. [18 refs.]

To the question asked in the title the authors' answer is "No." Their argument runs thus :—

In 1876, in a letter to PANCERI, SONSINO described from the ox *Schistosoma bovis* indistinguishable from *S. haematobium* except that it had an intestinal and portal habitat and that the eggs were fusiform and not ovoid. In reading this letter PANCERI prefaced it with the remark that it opened the way to investigation of the bovine haematuria which occurred round them. This has generally been accepted as a statement that *S. bovis* had a urinary habitat, while in fact SONSINO found no evidence of this infection in the bladder. When VEGLIA and LE ROUX (1929) named *S. mattheei*, they wrote that the new species had " never been found invading the uro-genital organs nor producing lesions as recorded for *S. bovis* by SONSINO [whom they had been unable to consult], KHALIL and others." In 1921 CAWSTON submitted specimens to LEIPER and these seem to have been identified by him as *S. bovis*. CAWSTON visited Humansdorp, where VEGLIA and LE ROUX obtained their specimens of *S. mattheei* from cattle and sheep, and recovered schistosomes from a sheep, which FAUST identified as *S. bovis*. The egg illustrated by BLACKIE as that of *S. mattheei* is indistinguishable in shape and size from that of *S. bovis*. MacHattie and Chadwick (1932) have shown that a diseased *S. bovis* may produce eggs corresponding in shape and size to those of *S. haematobium*. VEGLIA and LE ROUX claim that *S. mattheei* can regularly produce a mixture of eggs of *S. bovis* shape, of *S. haemotobium* shape, or intermediately shaped. " It would appear that BLACKIE has failed to produce any convincing evidence in support of his statement incriminating cattle and sheep as constituting a potential reservoir of human urinary schistosomiasis. One of the great difficulties in the elucidation of this problem is the desire on the part of workers to create new species on what to us appear to be the most trifling variations—variations which in other members of the animal kingdom would be considered as of no significance."

In support of these conclusions, with their wide and important hygienic implications are the finding of spindle-shaped eggs in man in areas where *S. bovis* does not occur in cattle ; variation in distribution of vitellaria of *S. bovis* in 4,000 specimens examined ; differences in intrauterine size of eggs from 90–205μ by 36–62μ ; the illustration of consecutive eggs from a uterus, one *S. bovis*-shaped, the other *S. haematobium*-shaped (photographed) ; immature eggs of *S. haematobium* from human urine showing marked elongation and spindle-shape (photographed) ; the failure of *S. haematobium* to infect sheep and of *S. bovis* to infect man ; and the recovery of a female *S. haematobium* measuring 28 mm. long and having 106 eggs in the uterus from a man of 82, and the suggestion that this specimen actually represents a female which has lived long enough to become fully developed.

C. L.

LEFROU (G.). Présence de *Bullinus dybowskyi* au Sénégal. La diagnose des *Bullinidae* africains. [**Presence of** *B. dybowskyi* **in Senegal.**]—*Bull Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1099–1105.

The title indicates the paper's scope.

A long quotation is given from ADAMSON, who was in Senegal from 1749 to 1753, describing the Bullinus ; as are diagnoses of the sub-genus *Isidora*, of *Bullinus* (*Isodora*) *dybowski*, *B.* (*I.*) *innesi*, *B.* (*I.*) *tropicus* ; of the subgenus *Pyrgophysa*, of *B.* (*P.*) *forskali* ; of the genus *Physopsis* and of *P. africana*. *C. L.*

MAGATH (Thomas B.). **The Relation of *Diphyllobothrium latum* Infestation to the Public Health.**—*Jl. Amer. Med. Assoc.* 1933. July 29. Vol. 101. No. 5. pp. 337–341. With 1 fig. [17 refs.]

The paper refers to the United States where, as predicted by STILES 26 years ago, Diphyllobothrium infection has become endemic. Magath points out that three-quarters of the reported cases have come from the central lake region and two metropolitan regions in the East to which fish from the lake region are shipped. Reasons are given for the belief that man is the essential definitive host, infection being spread to the intermediate hosts by his sewage. Of 25 cases seen at the Mayo Clinic none had anaemia which, it is pointed out, adds weight to the conclusion that the worm acts merely as a trigger. For prevention the author's advice is as follows :—

" 1. All sewage should be treated with some killing solution, such as formaldehyde or chlorine, before being discharged into lakes or streams.

" 2. People should be taught the necessity of thorough cooking of fish. ' Gefüllte ' fish should not be tasted during preparation for the table.

" 3. It has been demonstrated by Kjava and by Magath and Essex that submitting infested fish to temperatures of—10°C. for from twenty-four to forty-eight hours kills the larvae. Therefore freezing methods should be instituted in commercial houses that pack susceptible fish obtained from lakes known to be polluted.

" 4. Some system should be inaugurated for reporting human cases of infestation and isolating the infested persons until they are freed of the worm.

" 5. Stools of all Baltic immigrants should be examined.

" 6. A campaign should be undertaken to prevent feeding dogs with raw fish of the varieties known to be susceptible to infestation with *Diphyllobothrium latum.*

" 7. Further surveys of lakes and streams should be made in order to discover the extent of infestation of fishes." *C. L.*

YOKOGAWA (S.). **Report on Experiments with *Sparganum mansoni*, undertaken in an Endeavour to clarify the Nature of *Sparganum proliferum*.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Aug. Vol. 32. No. 8 (341). [English summary pp. 114–116.]

Yokogawa's experiments do not enable him to pronounce either for or against the identity of the two species of sparganum, though he personally doubts their independence.

S. mansoni has been studied sufficiently exactly to establish two unique features : (1) when the plerocercoid is removed from one intermediate host and fed to another which cannot act as a definitive host, it leaves the digestive tract and continues to grow as a plerocercoid ; (2) a plerocercoid placed for a few days in normal saline disintegrates all but the head, which in a suitable intermediate host proceeds to grow. Accordingly the question arose as to whether the prolonged application of mechanical or chemical stimuli could not induce the appearance of *S. proliferum* in *S. mansoni.*

Transference of normal or mutilated worms was made by swallowing or transplantation into over 80 experimental animals. When transplanted the worm migrates. If cut in pieces transversely the head and one or more adjacent pieces live, the others die ; and with death in the subcutaneous tissues there is much inflammation with caseation. After transference of *S. mansoni* into an experimental animal there were subsequently found in this host fewer worms in 52 cases, the same number in 18, and more in 7, the figure being without relationship to the interval since transference. Nor did those with increases show any morphological peculiarity. Diminution in numbers was chiefly due to acute inflammation, pneumonia or septicaemia, and plerocercoids in an inflammatory focus were always remarkably shrunken and deformed. As to causes of increased numbers, they appear to originate from the head and can possibly be induced by stimuli. Intravenous injections of grape sugar or calcium chloride had no observed relation to proliferation, nor did a tendency to do so in one host continue if the worm was transferred to a second ; indeed a deformed specimen generally returned to normal shape after transplantation into a fresh animal. No membranous covering enclosed the 7 forms which tended to proliferate, though it was sometimes seen with dead or dying worms, while the mode of proliferation seemed very different from that of true *S. proliferum.* *C. L.*

YOSHINO (K.). **Studies on the Post-embryonal Development of** *Taenia solium.* **Part I. On the Hatching of the Eggs of** *Taenia solium.*—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Oct. Vol. 32. No. 10 (343). [In Japanese pp. 1392–1409. With 3 figs. & 1 plate. [18 refs.] English summary pp. 139–141.]

These minute studies on the hatching of the eggs of *Taenia solium* were carried out on material obtained by autoinfection.

In intestinal, but not in gastric, juice the shell disintegrates, apparently by solution of a cement which connects the rod-shaped elements which compose it. The freed onchosphere shows in intestinal juice active movements of the hooklets and body ; the former it is held scratch a hole in the membrane with which it is still surrounded. After escape through this hole, the movements of hooklets cease but amoeboid movements are obvious. The hooklets are described as existing in any even number from 6 to 18 and their relative positions and movements are exactly detailed and their measurements given.

C. L.

SHORB (Doys Andrew). **Host-Parasite Relations of** *Hymenolepis fraterna* **in the Rat and the Mouse.**—*Amer. Jl. Hyg.* 1933. July. Vol. 18. No. 1. pp. 74–113. With 4 charts. [14 refs.]

The many important implications displayed in this comprehensive work are set out in the author's summary :—

" The study of *Hymenolepis fraterna* was undertaken to determine the relations of the parasite to its host, the black-hooded laboratory rat and the albino mouse. In all, 875 rats and a similar number of mice were used in experiments with results from which certain conclusions can be drawn. Two strains were used, the W strain obtained from wild rats and the M strain from white mice.

" 1. The eggs of *H. fraterna* are most viable at the time of passage from the host. From that time the viability when stored in water decreases till lost completely by the eleventh day. Salt flotation for isolating eggs appears to have no effect on their viability.

" 2. The prepatent period is from 11–16 days for the W strain in rats and 15 days and over for the M strain in mice. The worms grow rapidly after the cysticercoid stage till mature. At that time they vary in length from 3–240 mm. The size of the worms on the seventh and eighth days of infestation seems to show effects of resistance of the host, as the more worms present at that time, the larger they are. From the thirteenth day on, however, the size of the worms is affected radically by the number present and the smaller worms are found in the larger infestations. Egg counts and Lane examinations [D.C.F.] show that the period of egg production is very short in animals infected with a single dose of eggs, ranging from one to 11 days, while daily autopsies show that the loss of worms from the thirteenth day on after infection, is rapid and constant.

" 3. The natural transmission of *H. fraterna* was studied by placing a number of infected and non-infected rats in a cage when they came in contact with their own feces. This worm is transmitted easily from one rat to another under these conditions. Most of the rats were infected repeatedly. Evidence of age resistance and superimposed infestation is also shown by results of this experiment.

" 4. The average development of eggs of *H. fraterna* in rats and mice is less than 1 per cent. In rats, when very large numbers of eggs are given at one time, there is some evidence that the worms are thrown out due to a host reaction.

" 5. There is an initial resistance found in rats and mice during the period of nursing which is lost a short time thereafter. In older animals not previously infected there is a resistance which is gradually built up to a point where rats are highly resistant at five months and mice are much less susceptible at seven months than at two.

" 6. There is a distinct resistance to superimposed infestation found in both rats and mice but especially in mice, although it is possible to superimpose infestations in either.

" 7. The two strains of the dwarf tapeworm used in this study proved to be distinctly different. One, the W strain obtained from wild rats, was almost equally infective for rats and mice and the other, the mouse (M) strain, was distinctly more infective for mice than rats. This is shown by the worms of the M strain developing faster and to a larger size and also producing a larger incidence and worm burden in mice than in rats. The difference between these strains is striking in mice but in rats, which are almost immune to the mouse strain, it is much more evident. The discovery of these two strains which seem no less different from each other than the human and rodent forms of the dwarf tapeworm make it seem possible that *H. fraterna* might be considered synonymous with *H. nana*.

" 8. A diet consisting of white bread and water reduced the resistance of rats to the non-specific strain (M) and also the resistance connected with age. On the other hand the worms will not develop to maturity in mice on this diet." *C. L.*

KIRIBAYASHI (Shigeru). **Studies on the Growth of *Hymenolepis nana*, with Special Reference to the Possibility of Differentiation of *H. nana* var. *fraterna* (Stiles).**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Sept. Vol. 32. No. 9 (342). [In Japanese pp. 1175–1190. [22 refs.] English summary pp. 117–118.]

The English summary of these studies on the growth of *Hymenolepis nana* is not very clear but its principal conclusions seem to be the following :—

" *H. nana* of human and *H. nana* var. *fraterna* (Stiles) of rat origin can be established directly in white mice or rats without any intermediate host.

" In the direct infection experiments with Hymenolepis, both of human and rat origin, I could find no difference in development and structure in the various stages from the encapsuled or free larva to the young or adult worm.

"Hymenolepis, both of human and rat origin, can be established directly in man, especially in a small child, by ingestion of the egg. I could not find any difference between either the larvae or the adults of the two forms if they were obtained from one host.

"The length and width of the worm may differ according to the host, but they are the same in the same host and correspond biologically and morphologically. Therefore I conclude that *H. nana* of human and *H. nana* var. *fraterna* (Stiles) of rat origin cannot be differentiated." *C. L.*

ADAMS (A. R. D.). **Two Further Cases of Human Infestation with *Bertiella studeri* (Blanchard, 1891) Stiles and Hassall, 1902, with Some Observations on the Probable Synonymy of the Specimens previously recorded from Man.**—*Ann. Trop. Med. & Parasit.* 1933. Oct. 21. Vol. 27. No. 3. pp. 471–475. [12 refs.]

These two new cases of Bertiella infestation, recorded from Mauritius, raise the number of reported human cases to nine. Only *B. fallax* is believed to have specific characters which undoubtedly differentiate it from *B. studeri*, the type species.

After discussion of the described characters of the various supposed species, Adams points out that his two specimens have markedly bilobed vitelline glands, a feature not apparently stressed in recorded descriptions but one which appears to him of more importance than a number of the minor differences in the structures of the genitalia which have received considerably more attention. Accordingly he endorses MEGGITT's and SOUTHWELL's views on synonymy, more particularly regarding *B. satyri*, *B. mucronata* and *B. polyorchis* as synonyms of *B. studeri*. *C. L.*

DIXON (H. B. F.). **Two Cases of Cysticercosis** (*Taenia solium*).—*Jl. Roy. Army Med. Corps.* 1933. Aug. Vol. 61. No. 2. pp. 126–128.

These cases are of interest in relation to Col. MACARTHUR's study of cysticercosis as a cause of epilepsy in man [this *Bulletin*, Vol. 30, p. 680].

"These two cases illustrate how necessary it is to view with suspicion all alleged idiopathic epilepsy occurring in soldiers, aged 24 to 26, who suddenly develop fits in the later years of their service overseas.

"The character of the fit is not really of importance as fits caused by the *Cysticercus cellulosae* may simulate a true idiopathic epilepsy; the important fact is that the epilepsy usually manifests itself between the 22nd or 24th year.

"It will be noted that neither of these cases gave a history of tapeworm."

C. L.

MACARTHUR (W. P.). **Cysticercosis and Epilepsy.** [Correspondence.] —*Brit. Med. Jl.* 1933. Oct. 14. p. 711.

To aid an investigation on the connexion of cysticercosis and epilepsy in the Army, any diagnosis of cysticercosis in an ex-soldier should be notified to Col. MacArthur. *C. L.*

MAPLESTONE (P. A.). **The Frequency of Hydatid Disease in India.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No. 7. pp. 377–379.

Evidence suggests that hydatid disease is commoner in India than the records in medical literature indicate.

Its relative rarity Maplestone attributes certainly in part to the fact that in India the dog is not the companion of man; but also to the consideration that scarcity of animal food forbids the casual throwing of liver and lungs to dogs; and finally to climate, so falling in with Australian experience where the infection is greater in the cooler south than in the hotter north. He records 20 cysts in all, an addition of 4 to the Indian literature; compares these percentages with those of DÉVÉ compiled from 2,727 cysts; points out that from their very different totals the series are not comparable; and suggests that since, of the 20, one each was found in breast, kidney, spleen and cellular tissue, the probabilities are as stated in the opening sentence. *C. L.*

LÖRINCZ (F.). Die Rolle der Katze in der Verbreitung der Echinococcosis. [**The Rôle of the Cat in the Spread of Hydatid.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. July 11. Vol. 129. No. 1/2. pp. 1–11. With 30 figs. [11 refs.]

The author's experimental work brings him into sharp disagreement with the statement that the cat is an agent in the dissemination of hydatids.

He has used 11 dogs and 51 cats. In the former, development was normal, maturity being reached in 36 days, in the latter slower, with complete failure to reach sexual maturity, and in them diarrhoea was a common symptom. Moreover, while infection persisted in all the dogs until they were treated after 5 or 6 weeks, 14 of 31 cats carefully examined relieved themselves spontaneously of the infection. The question is raised whether in those instances where *E. granulosus* has been reported in cats, a different species or a biological variety has not been in question. *C. L.*

PLAZY (L.) & DAMANY (P.). Cancer primitif du foie chez un noir porteur de kystes hydatiques. [**Primary Liver Cancer in an African with Hydatid Cysts.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1015–1018.

A Senegalese, after 4 years in Morocco, died in Toulon of a primary carcinoma of liver situated about a hydatid cyst.

This hepatic cyst was crammed with daughter cysts, while a second one in the caecal region contained hooklets. In the liver a cirrhotic meshwork enclosed carcinomatous masses which had passed through the diaphragm and caused pleuritic effusion, and had matted together the viscera in the upper abdomen, including an enlarged but not cancerous spleen, and had filled the abdomen with fluid. Both effusions were deeply bloodstained. Eosinophilia was absent from the blood and not notable round the hepatic hydatid. It is pointed out that in Africans both French and other observers have reported that primary cancer of the liver is relatively common. It is felt that the hydatid cyst played a part in its origin in this case. *C. L.*

BONNAL (G.), JOYEUX (C.) & BOSCH (P.). Un cas de cénurose humaine dû à *Multiceps serialis* (Gervais). [**Coenurosis in Man due to *M. serialis*.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1060–1071. With 1 text fig. & 7 figs. on 2 plates. [14 refs.]

A sixth case of infection is reported of which the first two by ROLFINKE in 1656 and KLENCKE in 1844 are of doubtful validity.

A woman of 59 who had never been out of France but was a dog lover had, when seen, a tumour in the right buttock which, as she stated with insistence, had wandered thither from the right thigh. Eosinophils 9. No intradermal or complement fixation antigen reactions. Under a local anaesthetic a tumour 90 by 35 mm. and weighing 250 gm. was removed. It is closely described. About half the scolices were malformed. When part of the cyst was fed to a dog of a year old, which had been segregated for some time, seven scolices had developed when this was killed 12 days later. They measured 12 to 35 mm. and possessed 35 to 78 segments with irregularly alternating genital pores, the usual taenia arrangement of genitalia and hooklets like those of the embryo—namely an average of 2 rows of 16 each, averaging themselves in length 142μ and 100 to 105μ. A table gives the number and size of these in 13 species of Multiceps, and from the consideration of geographical locality, a feeding experiment, habitat, appearance of the cysts, and the characters of the hooks it is identified as *M. serialis*. The hosts of this parasite are enumerated (the definitive in general and the intermediate in detail) and the 5 previous cases are noted with their references in literature [see also this *Bulletin*, Vol. 29, pp. 54 & 416]. *C. L.*

DÉVÉ (F.). La souris blanche, animal réactif pour les inoculations échinococciques. Un essai de sérotherapie anti-echinococcique aspécifique. [**Use of White Mouse for Experimental Inoculation of Echinococci: Serotherapy.**]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1443–1445. With 1 fig.

White mice are readily infected with echinococci, but the treatment used did not prove effective.

Injection of "hydatid sand" subcutaneously is an uncertain method of producing infection; intraperitoneal injection is certain and results in widespread dissemination of cysts of a size rather less than that of a successful subcutaneous experiment. This circumstance provides a ready means by which therapy can be tested. Injection of serum from the street dog, that is to say one infested by various kinds of taenia, has not prevented infection in white mice, even when given in quantities which weight for weight correspond to 2 litres in a man of 60 kilos.

C. L.

PETRUSCHEWSKY (G. K.) & TARASSOW (Viktor). Versuche ueber die Ansteckung des Menschen mit verschiedenen Fischplerozerkoiden. [**Experiments on Infection of Man with Various Fish Plerocercoids.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Aug. Vol. 37. No. 8. pp. 370–372.

The authors point out that confusion has occurred owing to incomplete descriptions of plerocercoids which have been identified as those of *Diphyllobothrium latum*. These last actually occur in *Esox lucius*, *Lota lota* and *Perca fluviatilis*. But another kind of plerocercoid, called by the authors "Type B," has been confused with it. This forms a characteristically rounded cyst on the outside of the intestinal wall, the worm has a pointed head without a cleft at the hinder end and a smooth cuticle, the movements are weak; when fed to man from *Thymallus thymallus*, *Osmerus eperlanus*, *Acerina cernua* and *Coregonus*

albula, and to kitten and puppy from *O. eperlanus*, no infection followed. In identification of plerocercoids from fish, other than the 3 species first mentioned, there is then needed a detailed description and detailed transmission experiments. Of 28 plerocercoids of *D. latum* which were consumed 23 developed. The average daily rate of growth in pups is 1·3 mm. in the first days and 47 mm. later and in May 150 mm. daily. In one dog a second infection was induced, apparently 30 days after the first. A plerocercoid from the muscle of the " Kaulbarsch " or ruff, a species of perch, is that of *D. latum*.

C. L.

PRUIS (G. W. A.). Over ascarisintoxicatie. [**Ascaris Intoxication.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. May 23. Vol. 73. No. 11. pp. 685–690. With 3 charts.

The mechanical effects produced by ascarids in their wanderings through the body are highly important and are referable to the organ involved. That the symptoms produced are exclusively explainable on this basis is questionable and the possibility of production of a toxic substance by the worm itself, or by absorption after the death of the worms, is considered. Two cases of patients are described suffering from pyrexia and other symptoms, in one of whom there might even have been a fatal issue, and emphasis is laid on the disappearance of toxaemia as soon as the worms were evacuated. The author, however, contents himself with concluding that two cases, although suggestive, are not sufficient to support his contention of an ascaris intoxication.

W. F. Harvey.

[Evidence by Sir Patrick HEHIR and others for the existence of an ascariasis fever will be found in the *Indian Medical Gazette* for 1910–11. Moreover, when the commentator took over responsibility for lying-in cases at the Eden Hospital, Calcutta, in 1900, he found that the routine treatment for a post partum fever without apparent sepsis was santonin and that it appeared justified by its results.] *C. L.*

ASHFORD (Bailey K.), PAYNE (George C.) & PAYNE (Florence King). **Acute Uncinariasis from Massive Infestation and its Implications.**]—*Jl. Amer. Med. Assoc.* 1933. Sept. 9. Vol. 101. No. 11. pp. 843–847.

An important and, in its thoroughness, unique description of a small epidemic of acute ankylostomiasis, a neglected condition and in this case actually acquired during sea bathing. *A. duodenale* was the agent, a hookworm at least rare in Porto Rico.

Infection followed sea bathing at the place and time when a stream was discharging turbid flood water into the sea. Examinations covered a whole year and comprised haemoglobin estimations, blood counts including differential counts, and Price Jones curves daily for about a month, every 2 or 3 days for about 2 months more, and every week or two afterwards. Worm counts in large numbers were also made. The patients were still anaemic at the time of the report, though the authors were satisfied that intestinal worms were absent, the condition being attributed to strayed larvae. Full protocols are in the press and will be published shortly.

In the meantime the following points are made. The patient first seen (Case 1) had fever and intestinal haemorrhage and the diagnosis was typhoid with delayed agglutination. Nevertheless Ashford when consulted was dissatisfied, and from a consideration of all matters believed the trouble to be acute ankylostomiasis. Ova, 200 per gram, were seen for the first time a week later, on the 49th day; and by another week had risen to 26,500. Her blood loss into the intestine was so severe as to necessitate 3 blood transfusions.

Briefly, 6 of the 7 patients bathed in the sea during tropical rain which was at that time and place washing into it large quantities of muddied fresh water from a long-stagnant stream. All but one of them (she had remained in the water a relatively short time) found when they came out that the entire trunk under the bathing suit was peppered by small bites. Itching prevented sleep that night. A week later there was a feeling as if cold had been caught, with pain on speaking and swallowing. In another week there developed weariness, colic, diarrhoea, dark foetid stools with obvious or occult blood. Case 7 had not bathed but had earlier delved with her hands on the banks of the stream itself, a confirmation of the source of the infection. The table here compiled gives some details of the cases.

Case	Minimum		Maximum eosinophilia	Number of treatments with		Worms passed	
	haemoglobin	erythrocytes		caprokol	carbon tetra-chloride	spontan-eously	total
1	17	1,256,000	78	4	4	64	1,439
2	42	2,240,000	87	2	5	32	614
3	65	3,744,000	74	3	3	1	64
4	68	4,192,000	88	3	3	9	125
5	55	3,936,000	72	1	2	8	59
6	60	3,720,000	62	1	2	0	21
7	60	3,824,000	91	1	2	0	7

Treatment was firstly restorative in Case 1. Secondly it was anthelmintic and the authors "comment on the effects of caprokol (hexylresorcinol), a somewhat new and infrequent anthelmintic in uncinariasis. We consider a full dose 2 gm., . . . but in case 1 we did not exceed 1·4 gm. In several of our cases . . . it seemed to produce nausea and even vomiting, but it appeared to cause no other deleterious effect and was certainly efficient." [Would or would not other anthelmintics have merited this last commendation in these repeated doses ?] Ferrous carbonate in large doses was given to rebuild haemoglobin.

The authors do not stress the matter, but in the face of the strongly urged dictum that light infections are harmless it is well to point out how definite were the ill effects produced by seven intestinal hookworms, and to emphasize the care which was exercised in worm counts, as evidenced first by the numbers which were detected before any anthelmintic was given, and secondly by the fact that some were as small as 1·8 mm. long. It may be added that males preponderated and that the worms were very often filled with blood. It is *inferred* that these

ill-effects (which were markedly persistent even a year after infection and even when as few as 7 worms in all were found) were due to strayed larvae. "When most of the worms in the intestine had been expelled the percentage [of eosinophils] rose; but this was not on account of the expulsion of the worms. . . . The eosinophilia rises when the larval mortality in the tissues rises . . . towards the end of the third month from the time of the original invasion of the skin." [If this prove true, the too popular measurement, of ill effects in hookworm infection, on a scale of intestinal worm loads becomes even less defensible than it at present is.]

Referring to the Porto Rico Anaemia Commission of 1904 the authors comment :—

"Since that time hookworm disease has become, at least in the popular fancy, a public health problem relegated to the specific attention of sanitarians; and what was, at the time we were working, a disabling and very often fatal disease has become apparently merely a routine matter for health officers to settle.

"It is for the purpose of re-arousing the medical profession to a just conception of one of the great tropical diseases, as well as to corroborate a phase of uncinariasis on which few if any comments have ever been made and further suggest that there is probably still another and more sinister aspect of what has seemed such a simple illustration of parasitic invasion, that we have decided to break a silence of twenty-five years on a subject that seems for some time to have been considered closed and completely investigated."

[It is delightful to have Colonel Ashford again actively interested in hookworm infection after this great interval, and to read his endorsement of the conviction that more work is greatly overdue on this most important infection.] *C. L.*

GRANT (Alan M. B.). **A Short Note on the History and Elimination of Hookworm at Nauru.**—*Med. Jl. Australia.* 1933. June 17. 20th Year. Vol. 1. No. 24. pp. 733–734.

"I feel that no infected person examined could have escaped this drag-net of diagnosis, and that we are justified in saying that hookworm has been almost eradicated from the Nauruans."

This island lies close to the equator with a central lagoon surrounded by damp, shady, fertile soil, and with a sandy quick-drying foreshore. There are 1,500 Nauruans and 1,000 Chinese labourers; the latter with their 3 years' contract being wired in, given mass treatment, and allowed out only to work. The paper is not concerned with them. Among 1,000 Nauruans Willis's technique displayed hookworm and whipworm eggs in 89 and 25 per cent. respectively round the lagoon, and in 41 and 50 per cent. about the foreshore. The anti-hookworm measures adopted were: deep pit latrines with concrete covering slab, raised concrete platforms for houses, and the giving of a number of mass (? herd) treatments with a mixture of carbon tetrachloride and oil of chenopodium in liquid paraffin. Subsequent diagnosis was by Barber's glycerine saturated salt method, and by culture, which was in effect trapped, both methods being used in all cases. In about 700 persons examined only one case of hookworm infection was then detected (in the Lagoon district) but in this area trichuris infection was found in 65 per cent. and in the foreshore area in 35 per cent.

[Owing to the way in which glycerine clears hookworm eggs and causes them to disappear while enhancing the visibility of trichuris eggs, the two surveys are, it is suggested, not comparable.] *C. L.*

AHMANN (C. F.) & BRISTOL (L. M.). **The Effect of Diet on the Worm Burden of Children infected with** *Necator americanus* **and** *Ascaris lumbricoides.*—*Southern Med. Jl.* 1933. Nov. Vol. 26. No. 11. pp. 959–962. With 2 figs.

Used under certain stringent conditions Stoll's egg-counting method has been found accurate to within less than 5 per cent. and demonstrated as a satisfactory measure of worm load. Ascaris infection has disappeared under observation, and hookworm infection has trended to reduction, with, on improving the diet, a marked decrease of egg counts in one case, and a less marked change in another.

For Stoll's egg-counting, a period of training covering about 50 slides was necessary before one worker consistently counted as many eggs on one slide as did the other. After citing experiments, it is added: "From these results it can be seen that this method is sufficiently reliable for following the change in worm burden when an average of 4 or more counts from the same dilution is used."

Two children were followed by egg counts from April to January, and one from April to July. During the first 4 months their food, in a detention home, lacked milk, fresh vegetables and fruit; during the last 5 months these and cod liver oil were provided daily for two of them, the third ceasing to be followed after having shown no change in hookworm egg counts during this observation period. Of the two, B.P. showed a slightly higher and M.P. a slightly lower egg count for hookworms at the end than at the beginning of this period; or, as the authors put it, the one showed no decrease in the worm burden, while the other showed a slight decrease in that burden. In both children the ascaris counts fell.

Under the extra diet B.P.'s egg counts fell for 3 months and after a severe intestinal disturbance rose 5 weeks later to the highest level recorded, "apparently due to reinfection"; while M.P.'s count fell appreciably in the second month when the child developed definite symptoms of reinfection, and by the third month of the experimental period the count was higher than at any time during the control period," there being a slight drop later; in both cases ascaris ova disappeared.

[The authors' assumption that egg counts are a measure of worm loads is untenable. To take this question of diet alone, FORSTER and CORT (this *Bulletin*, Vol. 29, p. 762) showed that a change, in this case a worsening, in diet increased egg counts of *A. caninum* from 500 to 1,000 per cent. in conditions in which these latter writers were satisfied that reinfection could be excluded. Further the assumption here that increased egg counts in M.P.'s case implied reinfection appears to give a preadult period of under 4 weeks, one shorter than has been definitely noted for the hookworms of man.] *C. L.*

DE LANGEN (C. D.) & EERKENS (J. W.). **Nephroses and Ancylostomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 195–198.

The authors have met nephroses frequently in Java and find a connexion between them and ankylostomiasis.

Having noted that, among the many patients admitted to their hospital with oedema, some fulfilled all the diagnostic essentials of

nephrosis, and that most of the latter group had hookworm infection, the authors made detailed studies of 20 such cases admitted during 10 months and found 17 so infected. The average infection rate among all patients, presumably to the same but unstated technique was about 50 per cent. All these 20 had casts, and these were still being passed when they were re-examined 1 to 8 months after deparasitization was judged to have taken place. The 3 negative cases came from heavily infected districts, 2 of them having positive Wassermann reactions and owning to lues. Of 181 patients with kidney trouble treated at the Central Public Hospital, Batavia, it appears that 50 had nephrosis. Of these 50, 37 showed ova, 8 were negative but were examined once only and came from heavily infected districts, 4 were negative to repeated examinations and the other one had diabetes. In Keboemen Hospital, where practically all patients were infected, there were 74 cases of nephrosis to 13 of nephritis. At Bandoeng, where infection is not particularly common there were 27 with nephritis and 15 with nephrosis. Of the latter 7 had hookworm infection, 3 lues, 1 quartan malaria, while the other 4 are described as " nephroso-nephritics."

C. L.

SFAMENI (Antonino). L'anchilostomiasi nella provincia di Messina. [**Ankylostomiasis in Messina.**]—*Riv. Sanitaria Siciliana.* 1933. July 15. Vol. 21. No. 14. pp. 1096, 1099–1100, 1103–4.

Brief notes are given of ten patients resident at Messina, three in one family, two in another, with somewhat vague complaints of debility or intestinal disturbance, in whose faeces hookworm ova were found. The cases were quite straightforward and cleared up after treatment with thymol.

The author states that he has read that carbon tetrachloride is good for ankylostomiasis, but that too many precautions appeared to be necessary to avoid its toxic effects. *H. H. S.*

STILES (Ch. Wardell). **The Nurse's Opportunity in Hookworm Disease.** —Reprinted from *Public Health Nursing.* 1933. Aug. 4 pp.

Stiles shows how great a part the bedside and the rural public health nurse is destined to play in the attack on hookworm infection in the United States, and how ill-advised is the present policy of economy which has recently handicapped the work of the public health nurse.

The bedside nurse by taking note of anaemia, scanty pilosity, tibial scars, delayed menses and a history of ground itch can get her suspicions set at rest by microscopical faecal examination. The rural public health nurse, with her energy, enthusiasm and faithfulness, has done and is doing most valuable work by enlisting the co-operation of teachers in the detection of suspected pupils on the basis already noted (this *Bulletin,* Vol. 29, p. 418) by means of her own symptomatic examinations, and by persuasion of reluctant parents, so that these suspects may be induced to deliver faeces for that microscopic " selective " examination which Stiles advocates. She can also meet a relatively new obstacle. " In 1927 the Rockefeller Foundation announced that ' hookworm disease has almost disappeared from the United States.' This highly exaggerated statement from such a prominent authority, which has accomplished so much good here and abroad in combating this malady, was broadcast by the lay press, reached a vast audience, and was accepted as authoritative by many people both in educated and uneducated circles. As a matter of fact the claim is

not in harmony with theoretical considerations, and is contradicted by actual clinical observation and by laboratory investigation. The nurse is in a position to help counteract the harm which this claim has done." Stiles is strongly against treatment on a symptomatic diagnosis without faecal microscopic examination, and in the very rare exceptions in which he has broken this rule carbon tetrachloride has not been used, nor should it ever be given unless ascaris is excluded. He is not a believer in "mass" or "herd" treatment. *C. L.*

PENSO (Giuseppe). Studi sull'anchilostomiasi. I concimi chimici nella profilassi dell'anchilostomiasi nelle campagne. (Ricerche sperimentali. [**Chemical Manures in Prevention of Ankylostomiasis.**]—*Ann. d'Igiene.* 1933. May. Vol. 43. No. 5. pp. 352–360.

The author tested the effects of addition of chemical substances, many of which are used in agriculture, on hookworm eggs and larvae. The following were employed in his experiments: nitrate of calcium, nitrate of sodium, sulphate of ammonium, sulphate of iron, chloride of potassium, "perphosphate" [? of potassium], calcium cyanamide and a mixture, each in strengths of 1 and 0·1 per cent.

Those bringing about death of the larvae were ferrous sulphate in 5 days in a dilution of 1 per cent., in 7 days if 0·1 per cent. was used, and the cyanamide of calcium, which in the greater concentration killed all larvae in 7 days; several survived the higher dilution (1 in 1,000) for 8 days. Nitrate of calcium, 1 per cent., killed the majority in 5 days, but some survived.

The first, therefore (Fe sulphate) proved the most efficient larvicide and it also delayed egg development for 72 hours. Moreover, it has the advantage of acting as a fertilizer for gardens, and is consequently very suitable from the agricultural aspect as well as that of disinfestor of human faeces. *H. H. S.*

i. WAKESHIMA (Tadasu). **Experimental Studies on the Tropisms of the Mature Larvae of Ancylostomidae. I. Report: Especially on the Thigmotropism of** *Ancylostoma caninum.—Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Aug. Vol. 32. No. 8 (341). [In Japanese pp. 1127–1150. With 12 figs. [29 refs.] English summary pp. 109–113.]

ii. ——. **II. Report: Especially on the Hydrotropism of** *Ancylostoma caninum.—Ibid.* Sept. No. 9 (342). [In Japanese pp. 1274–1290. With 4 figs. [22 refs.] English summary pp. 125–128.]

iii. ——. **III. Report: Investigations on the Chemotropisms of the Mature Larvae of** *Ancylostoma caninum.—Ibid.* Oct. No. 10 (343). [In Japanese pp. 1345–1371. With 6 figs. [37 refs.] English summary pp. 133–136.]

The dates of these publications on taxies of hookworm larvae lie between that of FÜLLEBORN and LANE (this *Bulletin*, Vol. 30, p. 687) so that Wakeshima was without that clarification of the position which was attempted in those contributions, particularly as to the exact definition of thigmotaxy and its division into positive and negative kinds.

i. From the result of a number of experiments of different sorts it is concluded that infective hookworm larvae exhibit manifest, though weak, thigmotaxy.

ii. Similarly, as the result of a number of equally ingenious tests it is concluded that " hookworm larvae are not, or certainly not under all circumstances, subject to hydrotropism."

iii. Various chemical substances were investigated and the results recorded as tested by mature larvae of *A. caninum.*

1. *Tissue extract, bile, blood.*—The method was to mix an equal quantity of these with a 4 per cent. agar solution and solidify ; alongside a straight edge of this, 2 per cent. agar was solidified. On this edge were placed petals of the larvae. The number of larvae found on the side with tissue extract, bile or blood was without exception much higher than that found on the other side, whether the added fluid were that of rabbit or dog. If the amount of blood were less than 5 per cent. there was no tropism.

Arterial and venous blood.—In plates similarly prepared there was no evidence of preferential migration in either direction.

Strong chemicals.—When a well was cut in the centre of a 2 per cent. agar plate and filled with hydrochloric or sulphuric acid or caustic soda solution most larvae from a tuft placed peripherally hesitated to enter the impregnated zone. When the well was filled with cresol solution, formalin or 1 per cent. aqueous solution of corrosive sublimate there was no such hesitation. The water of condensation round alcohol or tincture of iodine solution prevented satisfactory results. Lugol's solution killed them so rapidly that no sure taxy was recognisable.

Carbon dioxide and oxygen.—No taxy, positive or negative, was observed.

No relationship between chemotaxy and the retention or shedding of the sheath was detected though the matter was not examined statistically. [There is, then, definite further evidence of penetration of the sheath by nutritive substances—tissue extract and blood plasma and their possible effect on larval longevity cannot in future be summarily rejected.] *C. L.*

WAKESHIMA (Tadasu) & ABE (Sadaji). **Report on the Mass Treatment of Hookworm Disease, especially on the Effect of Certain Anthelmintics.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. Oct. Vol. 32. No. 10 (343). [In Japanese pp. 1383–1391. [27 refs.] English summary pp. 138–139.]

The doses and effects of the drugs employed in the mass treatment of hookworm are seen in the table :—

Relations between the doses of anthelmintics and their effect.

Doses of { Carbon tetrachloride	3·15 cc.	3·0 cc.	2·7 cc.	1·87 cc.	1·65 cc.	1·25 cc.
Doses of { Oil of chenopodium	1·0 cc.	1·0 cc.	1·0 cc.	0·6 cc.	0·5 cc.	0·5 cc.
Number of persons treated	18	55	23	34	11	21
Number of persons who expelled worms	15 (83%)	49 (89%)	21 (91%)	19 (56%)	6 (55%)	8 (38%)
Number of worms expelled	210	2,004	548	65	72	41
Average number of worms per person	12	36	24	2	7	2

With doses of 2·7 cc. of carbon tetrachloride with 1 cc. of oil of chenopodium, or with larger ones, there were 4 cases of headache, 5 of dizziness and 1 of colic *C. L.*

SCUDERI (Giovanni). La velocità di sedimentazione dei globuli rossi nella anchilostomiasi. [**Sedimentation Rate of Erythrocytes in Ankylostomiasis.**]—*Riv. Sanitaria Siciliana.* 1933. Sept. 1. Vol. 21. No. 17. pp. 1311–1314. English summary (4 lines).

The author's conclusions are these :—

(1) The rate of sedimentation is markedly accelerated in ankylostomiasis. (2) Return to normal rate after specific treatment indicates elimination of the parasite, which is confirmed by faecal examination. (3) If the rate remains the same after treatment as before, we can affirm with certainty that the parasite is still present, and this too is confirmed by faecal examination. (4) A hookworm patient with a normal sedimentation rate may be regarded as definitely cured.

The English summary appended to the paper goes further and states that in ankylostomiasis the sedimentation of red corpuscles is markedly accelerated, a return to a normal rate being directly related to recovery, and that the reaction may have a prognostic and prophylactic use in substitution for, or in confirmation of, the faecal finding. The published basis of the conclusions is 9 cases, 5 being followed up of which 4 were deemed cured and one was proved uncured by faecal examination. It is noted that the change in sedimentation rate is best ascribed to secondary anaemia, since in grave states of this kind this rate is markedly increased. The faecal diagnostic technique is not mentioned. [The inferences implicit are that general conclusions can be drawn from these small numbers, that the particular technique used for the faeces is of so little importance that there is no need to mention it, and that anaemia may be taken as a measure of infection.] *C. L.*

FAUST (Ernest Carroll). **Experimental Studies on Human and Primate Species of Strongyloides. II. The Development of Strongyloides in the Experimental Host.**]—*Amer. Jl. Hyg.* 1933. July. Vol. 18. No. 1. pp. 114–132. With 7 figs. [11 refs.]

This important work indicates that the active procreatory stage of this infection—comprising both male and female adult worms—takes place in the air passages.

Following on FÜLLEBORN's demonstration (1914. Vol. 18. *Beiheft* 5, *Arch. f. Schiffs- u. Trop.-Hyg.*) that in the course of their journey from skin to bowel some infective larvae remain in the air passages and there grow into adult females, and on KREIS's (this *Bulletin*, Vol. 30, p. 224) that parasitic males may be passed in the faeces, Faust has studied in 40 dogs 12 strongyloides strains—8 from man, 3 from primates and 1 from the dog. He has traced in the lungs, bronchi, and alimentary canal (except the appendix) the development from filariform larvae, through post-filariform larvae, pre-adolescent males and females, adult males and females, to eggs, and rhabditiform and filariform larvae. Migration from lungs to alimentary canal occurs primarily in the adolescent stage, fertilization presumably taking place in the lungs, for there the sexes lie in close proximity. Males were also

found unattached in the intestine and cystic duct, so that fertilization may possibly take place there also, but at least it must do so at some period before the female becomes embedded in the intestinal mucosa, in which males have not been found. It is further suggested that fertilized eggs proceed to direct, and unfertilized eggs to indirect, development, as being consistent with the observation that a strain remaining for any length of time in the host tends to change from an indirect to a direct type, that is as spermatozoa are presumably used up. There should, however, here be noted Faust's important experience, that the individual female does not lay eggs for more than about two months and thereafter is destroyed in the body, a finding which suggests that the explanation of this change may prove to be other than he proposes. It is pointed out that the site of mature males and females in the lungs indicates that in those organs lies a focus for what Faust terms hyperinfection, that is to say for the development of those small filariform infective larvae which need no extracorporeal life to reach that stage, and so, it may be commented, could carry on a long-term infection through successive short-lived forms. *C. L.*

CADHAM (Fred T.). **Infestation with** *Strongyloides stercoralis* **associated with Severe Symptoms.**—*Canadian Med. Assoc. Jl.* 1933. July. Vol. 29. No. 1. pp. 18–19.

An infection with strongyloides in one who had never been outside Canada and for some years not outside the prairie provinces.

A staff nurse in a local hospital suffered from severe diarrhoea, nausea, epigastric distress, urticaria, loss of weight to 40 lbs. and debility. Exhaustive examinations leading nowhere, the stools were examined after a drastic purgative and eggs of strongyloides discovered. "These eggs hatched *in vitro*. At intervals the motile rhabditiform larvae were also noted in the stools. The appearance of abundant larvae in the faeces coincided with the outbreaks of urticaria." Within a month of the administration of thymol she was in normal health and had fully regained her weight. It is pointed out that she may have obtained the infection in the course of her duty. *C. L.*

SATO (S.). Studien ueber die Therapie der Strongyloidosis. [**Treatment of Strongyloidosis.**]—*Fukuoka-Ikwadaigaku-Zasshi* (*Fukuoka Acta Med.*). 1933. Sept. Vol. 26. No. 9. [In Japanese pp. 1587–1610. [23 refs.] German summary pp. 89–90.]

Observations on the treatment of strongyloidosis were carried out *in vitro*, on experimental animals, and on man.

In vitro filariform larvae were killed by 10 per cent. yatren in 120 hours, by 1·5 per cent. stibnal in 72 hours and by 7 per cent. fouadin in 96 hours; while as regards nine dyes mercurochrome 220 was the most effective and methyl violet the weakest, the others being trypaflavin, dahlia, gentian violet, rivanol, crystal violet, flavicid and pyronin, The following were without effect: intramuscular injections of 7 per cent. fouadin in dosage of 0·05 to 0·1 cc. per kilo, oil of chenopodium combined with yatren, and the so-called milk cure of Mense. Rivanol by mouth gave uniform and good results, the dose being unstated in the German abstract. The action of gentian violet in large doses of 0·02

to 0·03 gm. per kilo was very marked but was somewhat dangerous for the infected dogs. Rivanol is advised for the prevention of auto-infection. *C. L.*

MATERNOWSKA (Irena). Intradermale Hautreaktion bei Trichinose. [**Intradermal Skin Reactions in Trichinosis.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Aug. 15. Vol. 129. No. 3/4. pp. 284–301. With 6 figs.

Intradermal reactions in trichinosis are, it is concluded, specific.

Thus they were positive in 23 men, 14 guineapigs, 44 rabbits and 12 pigs who were infected, and negative in 24, 7, 9 and 1 of the same hosts who were not infected, nor did peptone or salt solutions give positive results in infected cases. Similarly in man and animals infected with ascaris, an ascaris antigen gave positive results but a trichuris antigen did not. In man the immediate reaction, an oedematous wheal appearing within 9 hours, was nearly always followed by a delayed one, reaching its height in 24 to 48 and ending in 40 to 52 hours after the injection, and characterized by a cellular infiltration, with eosinophils, large and small lymphocytes and tissue cells. In guineapigs and rabbits the reaction tends to be only immediate early in the infection, with both phases later; though in rabbits individual differences are great. In pigs there is a direct reaction only, but cellular infiltration begins at once. In early infections there is in general a short immediate reaction only; in those of over 30 days a longer diaphasic one. The latter was first observed 5 days after infection and was obtained up to 400 days, the limit of the tests. Reaction depends on the date of infection, the concentration of antigen, the anatomic quality of the skin and, perhaps, the intensity of infection. It is a very certain diagnostic method for man and animals. *C. L.*

GORDON (Harold). **Appendical Oxyuriasis and Appendicitis based on a Study of 26,051 Appendixes.**—*Arch. Pathology.* 1933. Aug. Vol. 16. No. 2. pp. 177–194. With 7 figs. [40 refs.]

A study of the relation of *Enterobius vermicularis* to the appendix and to appendicitis.

"1. The incidence of appendical oxyuriasis is increasing. Oxyurids were found in 311 of 26,051 (1·19 per cent.) appendixes removed at operation. In the first 20,969 appendixes in this series, the incidence was 1·04 per cent.

"2. Oxyurids occasionally cause minute mucosal lesions in the appendix. These lesions are accompanied by evidence of living tissue reaction; punctate hemorrhages, slight exudation and necrosis. The lesions occurred in 12 instances only; to this condition the term "appendicopathia oxyurica" may properly be applied.

"3. In 256 instances the parasites occurred in the lumen of the appendix without producing visible lesions.

"4. In 33 instances oxyurids were found in the wall of the appendix. Evidence is adduced to show that in this group penetration occurred after operation in every instance. This type of invasion is therefore of no pathologic or clinical significance.

"5. No examples of appendicitis oxyurica occurred in my material.

"6. Oxyuris vermicularis is not a significant cause of appendical pathologic changes." *C. L.*

ELSBACH (L.). Klinische onderzoekingen over filariasis. [**Clinical Observations on Filariasis.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. May 23. Vol. 73. No. 11. pp. 647–658.

The author maintains that the pathological lesions produced by *Filaria bancrofti* are referable to a primary injury of the endothelium of lymph vessels and lymph nodes. The lymph pressure is too low and the anastomoses of lymph vessels too extensive to admit that occlusion of single lymph vessels by adult parasites or inflammation could be their sole explanation.

It is difficult to find adult parasites in these cases and difficult to allow, therefore, that lymphatic obstruction of a whole territory such as the lower extremity can be produced by their blockage. Nor is the blockage a real one, for if an affected leg be raised the swelling markedly diminishes. It is not the lymph vessel or lymph node which is wholly or partially closed by parasites or by inflammation, but the lymph circulation which is otherwise impeded. Filarial manifestations are typically restricted to regions where the lymph stream is in the reverse direction to the action of gravity. Lymph varices do not occur on the face or neck, seldom in the upper extremity and rarely on the abdomen. Clinical evidence, with cases given in support, has convinced the author that the primary symptom of filariasis is an affection of a definite part of the lymphatic system brought about by toxins of the adult filariae, acting on the lymphatic endothelium, predisposing to oedema and dilatation of lymphatic vessels and finally leading to elephantiasis. Microfilariae may be present in great numbers : they are probably non-pathogenic. Where, however, microfilariae are there also will there be adult filariae. If the toxin of the adult parasite passes to the blood stream it is rendered innocuous in the liver, kidneys or bone-marrow and, in any case, it undergoes much greater dilution than in the lymphatic system. It is lymphatic endothelium which is most exposed to its action. An indication of the stimulation of the lymphatic system is given by the absolute lymphocytosis and the appearance of plasma cells in severe cases of filariasis.

Acute filarial attacks have, according to current opinion, nothing to do with a filarial toxin but are secondary to inflammatory infections by low grade cocci. The lymphangitis, which is the essence of these attacks, differs, however, from ordinary lymphangitis, (1) in the frequency of occurrence of a general reaction, with shivering, vomiting, delirium, passage of little or no urine and jaundice ; (2) in a comparative absence of localization of the inflammatory process. The lymphangitis is regarded by the author as due to inefficiency of the lymphatic system, with diminution of filter action and of phagocytic activities.

A degree of immunity to clinical filariasis, as regards certain sections of the population in Paramaribo, even with equality of filarial infection, is apparent. Javanese and British Indians escape as also do the inhabitants of the bush lands, whereas young British Indians and Creoles living in the town are the main sufferers. The author ascribes this to a high resisting power on the part of the reticulo-endothelial system brought about by numerous malarial attacks in the former and the absence of this stimulus to the production of immunity of this tissue to filarial toxin in the latter.

His concluding remarks are :—" Filariasis is regarded as a specific affection of lymphatic endothelium due to the toxin of adult parasites, in support of which the arguments are advanced of, (1) the occurrence

of a primary elephantiasis in filarial patients without lymphangitis, (2) the severe general reaction of the acute filarial attack . . . and (3) the immunity to filarial toxin of sufferers from malaria.

W. F. Harvey.

[Proliferation of the endothelial layer about many adult wuchereriae is nowadays a matter of established observation, not one of inference.]

C. L.

O'Connor (F. W.) & Hulse (C. R.). *Wuchereria bancrofti* **Infection. Two Case Reports.**—*Lancet.* 1933. Aug. 19. pp. 404–406.

A further contribution to the study of filarial periodicity.

" Excision of lymphatic glands was performed in two cases diagnosed as filarial, with a view to recovering adult filarial worms. This object was realised. Both operations were performed before midday but close to that time, and it was predicted as the result of previous observations that if living female *W. bancrofti* were present, parturition would not have taken place but would be imminent or just beginning. The prediction proved to be exactly correct in both cases. In the first case, in which the glands were excised at 11.30 a.m., microfilariae were found in the vagina and, in very small numbers, in the lumen of the lymphatic close to the vulva. In the second case, while microfilariae were also found in the vagina, no embryos had reached the exterior of the parent worm before operation.

" In both cases microfilariae apparently healthy, and microfilariae and ova in various stages of degeneration, were found in the afferent radicals and cortical sinuses of lymphatic glands. In a separate group of glands from the second case healthy and degenerating microfilariae *but no ova* were found in similar situations. . . .

" How ova in addition to microfilariae may reach a lymphatic gland is not clear, but it seems possible that independent of abortion a few ova may pass to the exterior of the worm following the stream of microfilariae through the vagina at the end of parturition. If the parent worm is at some distance from the gland it is conceivable that the nearly developed ova will have completed development in the lumen of the lymphatic and, having stretched the chorionic membrane, be transformed into completely developed microfilariae by the time they reach the gland."

[These cases are in addition to those referred to by Lane in his paper on filarial periodicity (see this *Bulletin*, Vol. 30, p. 703–4).] *C. L.*

Drinker (Cecil K.), Wislocki (George B.) & Field (Madeleine E.). **The Structure of the Sinuses in the Lymph Nodes.**—Reprinted from *Anatomical Record.* 1933. June. Vol. 56. No. 3. pp. 261–273. With 10 figs. on 3 plates.

A by-product of these experiments, the object of which was to determine what cells line these sinuses, was the demonstration of a striking function of theirs, which presumably is of daily importance in filariasis.

Through their quartz canulae the authors injected into the afferent lymphatics of lymph nodes suspensions of Indian ink or acacia-graphite, at pressures proved normal for the young dogs they used. These particles at once adhered to the walls of the lymph node sinuses and to the reticulate fibres which cross them. " This quality of the cells

whereby adhesion of foreign particles takes place almost instantaneously must faciliate prompt and complete phagocytosis of foreign material."

[By the courtesy of Professor Drinker, the reviewer was able to show at the November Meeting of the Royal Society of Tropical Medicine and Hygiene two consecutive popliteal glands from the same dog, the afferent vessel to the lower of which had been injected by Dr. Drinker in the manner described above. A comparison of these beautiful specimens showed how very efficient was this spider's web action of the sinuses in retaining particles of Indian ink. By courtesy of Professor F. W. O'Connor there was shown, side by side with these, a section by him in which a single microscopic field displayed in a cortical lymph node sinus 14 ova of *W. bancrofti*, 3 still-coiled embryos and one extended microfilaria ; and others in which microfilariae entangled in these sinuses appeared to be in process of lysis.] *C. L.*

Korke (Vishnu T.). **Observations on Filariasis in Some Areas in British India. Part IX. Sind Area.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 437–440.

Of 500 thick blood films taken between 7 and 9 p.m. from male prisoners in Sind, none showed evidence of filariasis ; 446 were permanent residents and 54 came from other parts of India. *C. L.*

Popesco (Fr.). L'action thérapeutique de la fouadine sur la filariose canine. [**Therapeutic Action of Fouadin on Filariasis of the Dog.**] —*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 219–220.

Experiments with 14 dogs led to the conclusion that repeated large intravenous injections of fouadin are excellent in the treatment of filariasis of the dog.

The first injection had varied from 2 to 5 cc., the course has varied from 4 to 8 injections over 5 to 14 days, with a total of from 10·5 to 43·5 cc. After the 4th or 5th injection the animal shows fever, distress, loss of appetite, acceleration of pulse and respiration and catarrhal rhinitis with lessening of the number of microfilariae. A sure sign in males that these have disappeared is a double orchitis with ulceration of the scrotum. *C. L.*

Rao (S. Sundar). **Filarial Worms under the Human Conjunctiva.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No. 7. pp. 394–395. With 1 coloured plate.

Worms were not present in the pieces of conjunctiva excised.

A Calcutta Jewess of 16 had several members of her family infected with *W. bancrofti*. She had swelling of the left foot and ankle and increasing dimness of vision of the left eye.

" On examination, two worms, one on either side of the left cornea, were seen coiled up just under the conjunctiva. The worms were so prominent that they were visible from a distance. The patient was admitted into the Carmichael Hospital for Tropical Diseases on the same day. One worm was seized with forceps and held during removal of the portion of conjunctiva containing it, by Lieutenant-Colonel Kirwan, I.M.S. As the first worm was being removed, the one lying near the inner canthus disappeared temporarily and reappeared in the original site after 3 days, when it was excised. Neither of the worms could be found

although the whole of the portions of conjunctiva removed were sectioned, mounted serially and examined. The patient has been under observation for more than three months since the above operation and the worms have not appeared again in the eye."

Microfilariae never found ; eosinophils 6 per cent. *C. L.*

HSÜ-HSI-FAN. **On *Thelazia callipaeda* Railliet and Henry, 1910, Infection in Man and Dog.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Aug. Vol. 37. No. 8. pp. 363–369. With 3 figs. [16 refs.]

A fourth case of human infection with *Thelazia callipaeda*, at Changsintien, Wanpinghsien, is reported in a boy of 10 from whose conjunctival sac 5 male and 16 female worms were removed.

Examination of this material, of that reported by FAUST (this *Bulletin*, Vol. 24, p. 532), and of worms from dogs in Peiping, leads to the conclusion that all are specifically identical. For the first time detailed measurements are published, the worms from man running rather smaller than those from the dog. The author's findings do not agree with those of FAUST as to the shape of the oral capsule, the circumoral papillae whether from the new or from FAUST's material, and the caudal papillae of the male. He supports his contention by clear drawings. *C. L.*

HISSETTE (J.). Analogies cliniques entre les onchocercoses américaine et africaine. [**Clinical Analogies between the American and African Forms of Onchocerciasis.**]—*Bull. Méd. du Katanga.* 1933. Vol. 10. No. 3. pp. 61–3, 65–7, 69–73, 75–7, 79–81, 83.

This paper reinforces the author's conclusions (this *Bulletin*, Vol. 30, p. 709). After a long historic section there follows one on the resemblances between American and African onchocerciasis, in which it is emphasized that the absence or rarity of elephantiasis as a manifestation of the American form, where localization occurs high in the body, is no argument against its causation by this parasite in Africa. Stress is laid on the need for rigorous and detailed autopsies to throw light on controversial points. *C. L.*

GOYANES ALVAREZ (José). El "granuloma filariósico" por *Onchocerca volvulus*. [**Filarial Granuloma due to *Onchocerca volvulus*.**]—*Trabajos.* Madrid. 1933. June 15. Vol. 2. No. 15. pp. 41–42.

The author describes the detailed tissue changes set up by the presence of Onchocerca. He notes the endothelial proliferation resulting in marked fibrosis and the formation of giant cells, swelling of vascular endothelium, lymphocytic reaction and eosinophilia. The author acknowledges that his description tallies with that of A. S. MOHAMMED (this *Bulletin*, Vol. 29, p. 85) but an even fuller account is that of I. OCHOTERENA [*loc. cit.*]. *H. H. S.*

THOMPSON (W. E.). **Strangulated Hernia in Association with Dracontiasis and Hydrocele.** [Memoranda.]—*Brit. Med. Jl.* 1933. Sept. 16. p. 528.

Thompson publishes this case from the Nizam's Dominions, India, as illustrating the precipitation of an acute abdominal crisis by a tropical complaint which, in itself, is rarely dangerous.

A reducible right inguinal hernia of 9 year's duration had threatened strangulation a year earlier and had now produced complete intestinal obstruction for 48 hours. On cutting through the inflamed and oedematous spermatic fascia a guineaworm was found and dissected out from close relation to the proximal end of the inguinal canal. The worm was 52 cm. long and there was a hydrocele on that side, but not on the other. The author speculates whether the larval worm passes into the small intestine before leaving the lumen of the alimentary canal, and whether the presence of a hydrocele acted as an attraction to the female worm with its embryo-filled uterus. *C. L.*

CUSSET (Jean) & GOLDENFOUN (Z.). Etude d'une tumour du testicule chez un indigène atteint d'éléphantiasis. Essai sur la pathogénie de cette affection. [**Testicular Tumour in Native with Elephantiasis.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1106–1109.

On an examination of this Senegalese case the hypothesis is put forward that the oedema of those with elephantiasis is due to lymphangitis combined with a peripheral neuritis.

As to the microscopic characters of the mass, which comprised scrotum, hydrocele and testis and hung down to the knees, there seems to be a sharp difference of opinion. The authors describe it as an invasion by fibrous tissue and cartilage which encloses masses of Wolffian cells, in fact, a fibro-cartilagenous "dysembryome" with scattered cysts containing red corpuscles; the neoplasmic tissue taking the place of the noble testicular elements with disappearance of the seminal tubes. CORNIL of Marseilles, after examining a portion, designates it as inflammatory tissue with (1) nodules where this reaction is manifest with lymphocytes, plasmocytes, red corpuscles and histiocytes often containing yellow pigment, (2) local fibroblastic, collagene and hyalin change, (3) an intense angiomatous reaction with haemorrhages. Under diagnosis are mentioned the changes studied by PETIT and BAHR, the lymph vascular lesions reported by NATTAN-LARRIER and LAIGRET, and the fact that this and another case come from an area of elephantiasis. There is mention that NATTAN-LARRIER has reported several cases of cancer of the thoracic duct ("canal thoracique") secondary to filarial lymphangitis; and, relating to the controversy as to whether elephantiasis is of filarial or bacterial origin, the point is made that at first the skin is healthy.

[Examination of NATTAN LARRIER's paper discloses mention of thrombosis of the thoracic duct. No mention of cancer was traced.]

C. L.

CRUZ (Walter Oswaldo). Présence d'hémolysines dans les extraits de parasites intestinaux du chien (*Ancylostoma caninum* et *Toxocara canis*). [**Haemolysins in Extracts of Intestinal Parasites of the Dog.**]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 139–141.

There is found in these worms a haemolytic and heat resistant substance, but to give clear haemolysis the extract must be very concentrated and must act for a relatively long period.

Since there is but little of any haemolytic substance present and since it is non-specific, it is concluded that it is not an effective factor in the production of anaemia. *C. L.*

ALEXEIEFF (A.). Sur les facteurs déterminant le développment des oeufs d'ankylostomes.—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 930–934.

HARLEY (G. W.). Microfilariae and Insect-Saliva. [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. June 29. Vol. 27. No. 1. pp. 109–110.

SATO (S.). Immunologische Studien ueber die Strongyloides-Infektion.—*Fukuoka-Ikwadaigaku-Zasshi* (*Fukuoka Acta Med.*). 1933. Sept. Vol. 26. No. 9. [In Japanese pp. 1526–1586. With 17 figs. (4 coloured) on 4 plates. [61 refs.] German summary pp. 88–89.]

HSÜ (H. F.). On *Dracunculus houdemeri* n. sp., *Dracunculus globocephalus*, and *Dracunculus medinensis*.—*Ztschr. f. Parasitenk.* 1933. Sept. 6. Vol. 6. No. 1. pp. 101–118. With 38 text figs. [10 refs.]

SPRUE.

ADAMS (A. R. D.). **Sprue in Mauritius.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 199–200.

The author refers to the case of an Englishman invalided from Mauritius in 1930 suffering from a disease diagnosed in London as sprue. This patient returned to the island in good health after treatment. The case here reported in detail is, however, put on record as the first instance within the author's knowledge of a Mauritian being attacked, as there is a general belief that sprue does not occur in Mauritius.

The patient was a powerfully built man of 35 years who stated that his normal weight was 120 kgm. or over. He had suffered for 4½ years with dyspeptic symptoms and diarrhoea (two to ten stools daily), particularly in the early morning, the motions being bulky, pale, frothy and offensive. In the last 18 months he had lost 40 kgm. in weight and he appeared ill, pale and emaciated and complained much of flatulence. Temperature was normal, there was no jaundice and the tongue and mouth were not affected. The blood count gave 3,800,000 red cells and 8,500 white per cmm.; there was some poikilocytosis and two megaloblasts were seen in the stained film. [The size of the corpuscles is not stated.] Plasma calcium 7·8 mgm. per cent. There were no helminth ova seen in the faeces; analysis of dried faeces showed total unsaponified fats 30·6 per cent., free fatty acids 15·62, neutral fats 4·22 per cent. The van den Bergh test gave a delayed direct and very weak indirect reaction.

He was put on a milk diet and was given calcium and hydrochloric acid by mouth; in two months he gained 12 kgm. in weight. The diarrhoea ceased in a fortnight. The patient returned to work and for the past two months has kept well, but finds that he has to avoid certain articles of diet. There was no indication of pancreatic affection nor of any condition other than sprue to account for the steatorrhoea, a diagnosis borne out by the other symptoms present. *H. H. S.*

PICARD (René). Un cas de sprue avec syndrome neuroanémique. [**Sprue with Anaemia and Nervous Symptoms.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1933. Feb. 6. 49th Year. 3rd Ser. No. 3. pp. 89–93.

An interesting case is described in detail of a man of 48 years (but looking 60), much emaciated and anaemic, with protruberant abdomen and oedema of the legs. He gave a history of "dyspepsia" for 2½ years, with occasional vomiting, 7–8 whitish or yellowish stools a day, but never any obvious mucus or blood. He felt burning in the tongue and mouth and occasionally further along the alimentary canal.

In January 1931, the number of stools increased to 30–40 daily (but never dysenteric) and his state became so alarming that his brother, who was a medical man, brought him from Algiers to Châtel-Guyon. A few days later, *though he had no treatment*, the stools became normal for the first time in over 2 years. He returned to Algiers and his symptoms recurred, 7–10 pale stools daily. In October he developed nervous symptoms, diagnosed as polyneuritic. The neck muscles were first attacked, the head flexed, chin on sternum; he could not extend the head but lateral movements were preserved; a week later first one arm, then both became paralysed. This cleared in a fortnight and paraplegia with pain ensued, but never any sphincter trouble. This lasted for a month; there was no rise of temperature.

The following is a brief account of the results of examination of the blood. In January, 1932, red cells 1,000,000, white cells 6,200, slight relative lymphocytosis, 32 per cent., Hb. 20 per cent., C.I.2, and marked anisocytosis but no erythroblasts seen. He was given fresh vegetables, fruit *ad libitum* (he had a robust appetite), and calf's liver extract by mouth and intramuscularly. Thirteen days later red cells 2,200,000, Hb. 65 per cent., C.I. 1·5. On February 10th corpuscles 2,820,000, only one stool a day and that normal ; on 3rd May he said he felt well, red cells were 4,900,000. His weight which on 14th January was 48 kgm. had increased to 72·3 kgm., and he returned to Algiers and has remained well up to the time of the report (January 1933). Faecal examination had afforded but little information. Monilia was not found. The remainder of the paper considers briefly the question of pernicious anaemia and sprue and the nervous symptoms associated at times with the former and the author poses the question as to the unity of sprue and Addison's anaemia or whether this is a case of atypical sprue with nerve lesions but does not attempt a solution. [The spontaneous return to normal stools without any treatment at a time when symptoms were acute is a fact to be borne in mind in interpreting results following some particular form of treatment.] *H. H. S.*

COSTEDOAT. Le traitement de la sprue par le foie de veau. [**Calf's Liver in Sprue.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1933. Feb. 13. 49th Year. 3rd Ser. No. 4. pp. 171–173.

The author refers to ROGERS and COOKE's article on the benefit following intravenous administration of a liver extract in sprue [they used Hepatex P.A.F. (see this *Bulletin*, Vol. 29, p. 465)] and gives details of a man of 35 years, who for two years presented symptoms of sprue—stools 2–10 daily, fatty and pasty ; loss of weight, 8 kgm. in two weeks, 30 kgm. in three months ; red, sore and tender tongue (but no aphthae), and anaemia, red cells 1,382,000, white 4,200 per cmm. Blood transfusion on two occasions produced little if any amelioration ; emetine, stovarsol, yatren were unavailing. With a view to benefiting the anemia, calf's liver, 200 gm. uncooked, was given daily. Not only was the effect on the blood wonderfully rapid—in five days red cells were 2,980,000 and white 6,000, and a fortnight later 4,900,000 and 7,000 respectively but the other symptoms also cleared up and the patient left hospital " cured " 26 days after this treatment was initiated and 7 months later was still in good health.

[In remarking on this case the author states that " the liver extract first used had produced practically no result," but in the detailed account no mention is made of this, what preparation was used, the dosage or mode of administration. The future history of this patient would be of interest ; seven months' freedom from symptoms is not synonymous with cure.] *H. H. S.*

JEPSON (F. P.). **Dry-Wood-Inhabiting Termites as a Possible Factor in the Etiology of Sprue.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.). 1933. Feb. 1. Vol. 3. Pt. 1. pp. 3–46. With 16 plates (1 map). [5 pages of refs.]

This article is the elaboration of a suggestion put forward as a contribution to solving the obscure question of the aetiology of sprue. Since there is a fairly widespread belief, particularly in Ceylon, that

prolonged residence in a " dry-rot bungalow " predisposes to sprue, any evidence, for or against, must be welcome.

The author has made a serious study of this aspect of the subject, pointing out, first, that the usual interpretation of dry rot as fungal growth is not implied in this instance, but as the invasion of the constructing timbers by termites, and he suggests that the ingestion of the faecal pellets of these insects may play an important rôle.

In an outline map are shown, by means of a good graphic device, the places (or countries) where sprue occurs and where dry-wood-nesting termites are common, and the symbols employed demonstrate at a glance where the two coexist. The author is an entomologist and his medical facts and sprue records are largely taken from the literature.

The article, which is beautifully illustrated, savours somewhat of special pleading. In certain countries sprue is endemic but the presence of these termites, Cryptotermes and Planocryptotermes, has not been recorded. The author explains this by saying that absence of record is not the same thing as absence of termite and quotes, for example, the Philippines where they were not found till sought for, although " almost every house in the Islands is infested by these termites." The reverse of this is less easily explained. Thus, the termites are common in Jamaica but the reviewer in nine years' service there, visiting every inhabited part of the island, did not see a single indigenous case, in fact the only sprue patient was one seen in consultation who was staying for a few days in the course of an ocean tour. Again, the termites are present in Africa, both East and West ; nevertheless sprue is so rare in the African colonies that the majority of practitioners deny that it exists. Thirdly, the native wood huts harbour termites quite as frequently as do the bungalows of the Europeans, but, though a few cases have been recorded, somewhat as medical curiosities, in India, [see this *Bulletin*, Vol. 29, pp. 3 and 7] elsewhere natives are not known to suffer from sprue.

The author adduces in favour of his theory the fact that the disease attacks members of a family living in the same house ; so does enteric fever, smallpox and other infections, or, a more chronic example, leprosy. Finally, the termite theory does not seem adequate to account for cases developing years (ten and more) after the individual has left the tropics, without having shown signs previously. If any one theory is to explain the aetiology of sprue, it must meet all these facts. *H. H. S.*

MILLER (D. K.) & RHOADS (C. P.). **Production in Dogs of a Syndrome Similar to Sprue by Diets Deficient in Vitamin B_2.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Jan. Vol. 30. No. 4. pp. 540–541.

In the anemia of sprue treatment with vitamin B has been followed by rise in reticulocytes and improvement in the blood condition, and in other patients relief of glossitis and diarrhoea. To test what part lack of this vitamin might play in the aetiology of sprue, the authors fed 50 dogs on a diet low in protein, high in fat and carbohydrate and the only vitamin B that present in rice polishings, in fact a modification of GOLDBERGER's " black tongue producing " diet. The animals were not restricted as to the amount they took.

Stomatitis developed in a mild degree in all, the buccal mucosa was injected and presented circumscribed yellowish aphthae ; glossitis

was marked, the tongue becoming smooth and reddish with atrophy of papillae. At this stage many refused food, in part or entirely; vomiting was common and diarrhoea marked, the stools usually yellow, voluminous and semisolid, sometimes watery. Loss of weight occurred, about 24 per cent. of that at the beginning of the experiment; blood changes were definite in 30 and marked in 15 of the animals, the red corpuscles falling more than 50 per cent. from 6·4 to 3·1 million and the Hb. value by 30 per cent. (Sahli). At the height of the anaemia the bone marrow, normally fatty and fairly acellular in the dog, became replaced by solid, deep purple-red tissue, like that of cases of pernicious anaemia. Histologically, there was proliferation of endothelial cells and megaloblasts, but little tendency to maturation, very similar to the picture in sprue anemia. *H. H. S.*

SCHOTTMÜLLER. Die Behandlung der Sprue mit Leber und Eisen.—*Deut. Med. Woch.* 1932. Aug. 26. Vol. 58. No. 35. pp. 1356–1357. With 2 figs.

REVIEWS AND NOTICES.

MORSON (Clifford) [O.B.E., F.R.C.S. (Eng.), etc.]. **Urinary Infections.**—76 pp. Pocket-Monographs on Practical Medicine. 1933. London: John Bale, Sons & Danielsson, Ltd., 83–91 Great Titchfield Street, W.1. [2s. 6d.]

Beginning with a brief introduction on the pathological aspects of urinary infection the author describes acute and chronic colon bacilluria, urinary tuberculosis, genital tuberculosis of the male (presumably genital tuberculosis in the female is considered to be a gynaecological subject outside the scope of this monograph), infection in relation to renal calculus and urinary infections of childhood. There are also chapters on post-operative infections and renal function in relation to infection. The author states that the most important and by far the most common cause of infection of the urinary tract is the colon bacillus and the two chapters dealing with infection by this organism adequately cover the ground in so far as this can be done in a short monograph. The various urinary antiseptics are dealt with, though Mr. Morson considers that the only drug which really fulfils the function of a lethal weapon against infection of the kidney is hexamine. With regard to intravenous therapy in acute colon bacilluria, which is regarded primarily as a bacillaemia, the author concludes after examining the claims of the well-known antiseptics that injection of 100 cc. of a 20 per cent. solution of sodium chloride as recommended by FLEMING is the safest and the best. In the short chapter on chronic colon bacilluria the new ketogenic diet is described and a specimen dietary is given.

The chapter on urinary tuberculosis is a good detailed account of the disease. Mr. Morson emphasizes the importance of a full examination of the whole urinary tract. He also advocates a control examination of the chest with radiogram, for the presence of undetected lesions of pulmonary tuberculosis and infected mediastinal glands. The absolute necessity of a meticulous examination for the presence of tubercle bacilli in the centrifuged deposit of a twenty-four hours' specimen of urine is stressed. In the chapter on tuberculosis of the male genital tract not only are surgical measures dealt with but the medical aspect is considered at some length. The author's experience of tuberculin therapy over a period of 20 years has led "to nothing but disappointment," and he wisely sums up the medical aspect of the disease by emphasizing the importance of a prolonged stay in a sanatorium.

Coccal infections (staphylo- and streptococcal) of the urinary tract and their relation to renal disease and perinephritic abscess are dealt with briefly but the monograph contains little information about the gonococcus.

In discussing renal deficiency tests Mr. Morson rightly prefers the two well-known urine tests of blood urea and urea concentration, and when considering these in relation to prostatectomy he has no hesitation in recommending the operation when the blood urea is as high as 50 mgm. per 100 cc. provided there is absence of kidney infection.

There is a helpful preliminary discussion on predisposition and causation in the chapter on stone in the urinary tract in which dietetic factors, etc., are dealt with.

There are one or two slips in the monograph, the most serious of which is the use of bismuth antimony tartrate instead of sodium antimony tartrate for intravenous injection in bilharziasis as introduced

by CHRISTOPHERSON. A short list of larger textbooks for reference would be a helpful addition.

The book is a practical common-sense presentation of a subject which is all important to the general practitioner.

S. Roodhouse Gloyne.

BIBLIOGRAPHY OF HELMINTHOLOGY FOR THE YEAR 1931. (Compiled by A. WALTON from Titles selected by R. T. LEIPER.)—81 pp. 1932. Dec. St. Albans: Imperial Bureau of Agricultural Parasitology. [Price 6s.]

INDEX VETERINARIUS. 1933. Apr. Vol. 1. No. 1. pp. xxvi+304. Weybridge: Imperial Bureau of Animal Health. [Annual subscription £4.]

Early in 1932 the Imperial Bureau of Agricultural Parasitology, one of the Imperial Agricultural Bureaux, began the issue of an annual bibliography of helminthological titles. The first issue published in March 1932, with its Supplement dated February 1933, dealt with helminthological literature appearing in the year 1930, and gave some 1,090 titles collected from 410 periodicals. The "Bibliography of Helminthology for the Year 1931," here noticed, was published in December 1932 and contains some 1,290 titles gathered from 425 periodicals. Titles of individual papers are grouped under the names of the journals in which they appeared, thus departing from the more usual dictionary plan of entry under author and subject. This arrangement is followed also in the *Helminthological Abstracts* issued by the Institute of Agricultural Parasitology, to which the Bureau is attached. It enables one to see clearly what papers of helminthological interest are to be found in particular periodicals, but users who want to know what papers have appeared on a particular subject rather than in a particular journal would probably prefer an arrangement by subjects. An authors' index is given at the end of the bibliography; the more necessary subject-index to titles is published separately and at a later date, and is advertised as being "free on application." The titles noted—drawn from zoological, medical, veterinary, agricultural, and horticultural periodicals throughout the world—are of papers containing helminthological data concerning distribution, systematics, life histories, biology, pathogenesis, therapeutics—especially the growing subject of chemotherapy from the anthelmintic standpoint and in relation to toxicology—and prophylaxis. These annual bibliographies are well printed and carefully edited, and provide permanent, if somewhat belated, records of the literature of helminthology year by year, which should be of great service in all institutes where medical, veterinary, or agricultural research work on parasitology is pursued.

Quite recently the Imperial Bureau of Animal Health, also a body founded under the scheme for Imperial Agricultural Bureaux, has begun the issue, under the title *Index Veterinarius*, of a bibliography of publications relating to veterinary research, administration, public health and education. The first number, dated April and issued in November 1933, covers indexing done at the Imperial Bureau of Animal Health during the first quarter of the year 1933. Subsequent issues, to be published at three monthly intervals, will cover titles indexed at the Bureau in the corresponding previous quarters, thus providing an early source of information of titles of papers of veterinary interest

appearing in current publications. The references in the *Index Veterinarius* are to original articles, reports, books, theses, etc., given under both author and subject in one alphabet on true dictionary lines. Author entries give the full titles of papers in the language of the original, subject entries give brief translations of foreign, and shortened versions of English titles. Numerous cross-references help to make the work self-indexing. The text is reproduced in typewritten characters by the Gestetner duplicating method in double column on one side of the paper only. To get the best results by this process a thick absorbent paper has been used with the result that the first issue, covering only one-quarter of a year's output, weighs 3 lb. and measures over one-and-a-half inches thick. For a bibliographical work that may have to stand up to generations of users such bulk and weight are serious drawbacks. Within the limitations imposed by this method of production, however, the work is well displayed, and is a striking testimony to the amount of veterinary literature indexed at the Imperial Bureau of Animal Health.

But the question arises whether by concentrating within a single Bureau the whole task of preparing an *Index Veterinarius* the opportunity for useful co-operation has not been missed. Bibliographical work, more even than abstracting work, lends itself to collaboration, and with several Imperial Agricultural Bureaux dealing intensively with certain branches of veterinary science such as parasitology, animal nutrition, animal genetics and veterinary entomology, consideration might perhaps be given to the possibility of their co-operation with the Bureau of Animal Health in the preparation of future issues of the *Index Veterinarius*. A comparison of the journals watched by the various Bureaux shows that though certain journals are seen by all, each has on its list an appreciable number with occasional veterinary papers that are not duplicated on the other lists. Co-operation, perhaps on the lines of making each specialist Bureau responsible for the section of the *Index Veterinarius* that concerns it most, would mean a much more complete record, and might at the same time lead to a clearer definition of the respective fields of work of the various Bureaux and thus to the avoidance of what appears to be unnecessary duplication. *R. L. S.*

BIOLOGIE MÉDICALE. Supplement. 1933. Dec. 31st Year. Vol. 23. 124 pp.—**Bibliographie du stovarsol 1921–1933.** [Bibliography of Stovarsol 1921–33.]

The preface to this brochure states that it gives the references to more than a thousand publications on stovarsol. These are arranged in two divisions, the first classified according to the therapeutic application and by the alphabetical letter of the author's name, the second in chronological order by years; the latter is the more complete. The headings of the first division give an idea of the uses of this drug—protozoal infections of the digestive tract; protozoa, of blood, bronchi and skin; yaws; syphilis; tuberculosis; helminthiasis. Stovarsol is of value in spirochaetal diseases, in amoebiasis, in giardiasis, in balantidiasis and in malaria in association with quinine. It is noted as curious that whereas orsanine, an isomer of stovarsol, is a good trypanocide, stovarsol itself is ineffective. *A. G. B.*

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